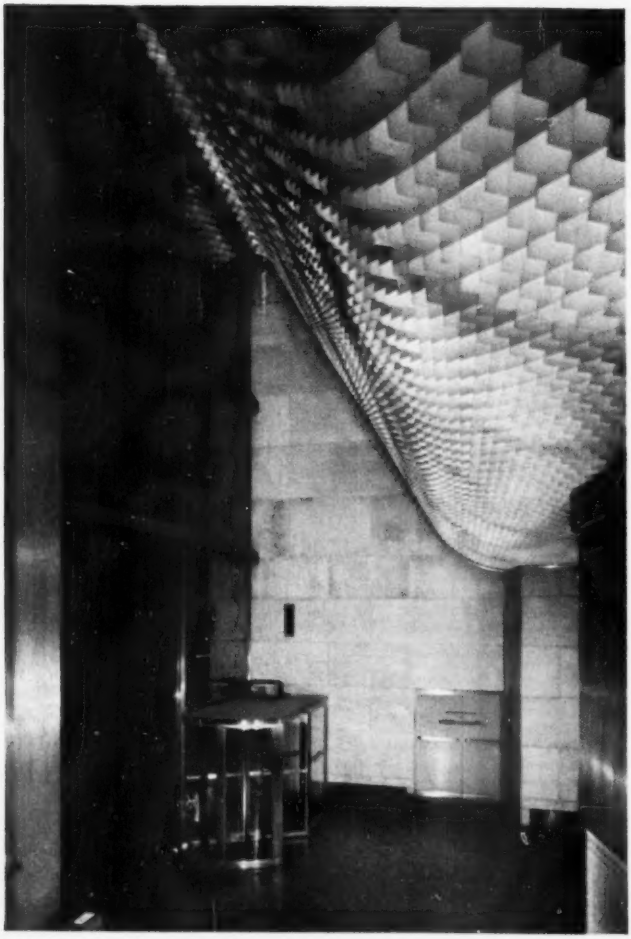
APRIL 1952
PRICE 35 CENTS

ELECTRICAL CONSTRUCTION AND MAINTENANCE

WITH ELECTRICAL CONTRACTING



NEW MOBILE COLOR *lights lobby in preset spectacular patterns to give unique identification to a New York building entrance.*

A McGRAW-HILL PUBLICATION | 51ST YEAR

Stadium Lighting Installation—Pole base mechanism permits 3-ganged cutouts to be switched from ground.

Combine fuse protection with "disconnect-under-load"

Low-cost G-E oil fuse cutouts give you both

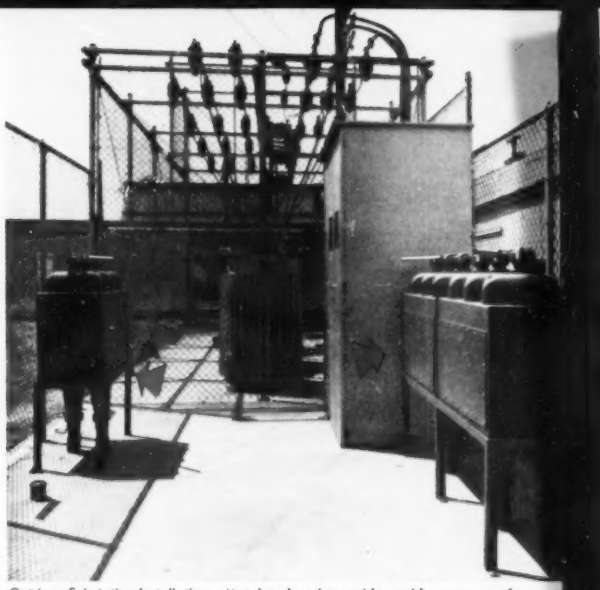
In the G-E oil fuse cutout all arcing occurs under oil when the fuse blows or when switched. The housing, with its drawn steel tank threaded into cast-iron cover, is liberally designed for safety; withstanding internal pressures well in excess of those that can occur at the cutout's interrupting rating. There are no exposed live parts—whether the cutout is in open or closed position—and no expulsion of arc flame.

Special arcing surfaces on the heavy self-aligning contacts keep load-carrying surfaces clean—make it possible to use these cutouts repeatedly as switches to open circuits under loads.

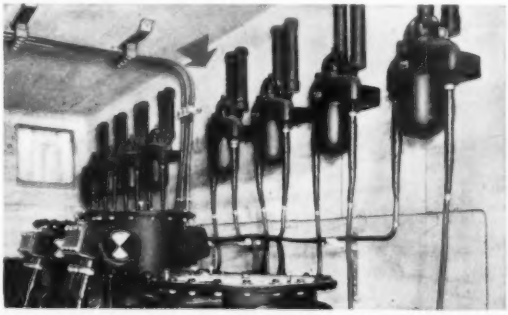
Suitable for both utility and industrial applications, these cutouts are—

1. **Available for 2400-, 4160-, and 7200-volt circuits, current ratings up to 300 amperes; interrupting ratings up to 11,000 amperes.**
2. **Ideal for indoor mounting, vault or subway mounting and outdoor pole or wall mounting.**
3. **Available in metal enclosed assemblies, single or three-phase, rack or wall mounted, and providing for cable, conduit, or pothead connections.**
4. **Provided with switching mechanisms for single- or three-phase switching and pole base operation on rack-mounted or metal-enclosed units.**

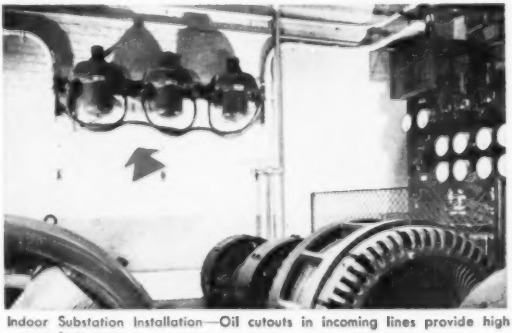
Full information can be found in Bulletin GEA-732—available through your G-E Apparatus Office, or by writing, *General Electric Company, Schenectady 5, New York.*



Outdoor Substation Installation—Metal enclosed assembly avoids exposure of cable entrances and gang-operated mechanism provides for simultaneous switching.



Subway Installation—Expansion chambers attached to cutouts permit complete submersion.



Indoor Substation Installation—Oil cutouts in incoming lines provide high current fusing.

405-40

GENERAL ELECTRIC

NEW LOW PRICES on Murray load centers

Fully Magnetic!

1. Breakers always carry the full load, *regardless of temperature*, they never need "derating."
2. Breakers trip instantly at 10 times rated current. This means a 15 Ampere breaker trips at 150 Amperes—carries all temporary overloads but trips instantly on short circuits and dangerous overloads.

Murray offers you load centers of the *highest quality* at prices *far below* your expectations. When you install Murray Load Centers, your customers get maximum satisfaction at a low cost. In addition to the high quality of material and workmanship, you get load centers equipped with fully magnetic circuit breakers.

$8.25 LIST (with 2 breakers)
Cat. No. LB002. Two circuits, 40 Amp. Main.

$11.55 LIST (with 2 breakers)
Cat. No. LC002. Two circuits, 55 Amp. Main.

$27.00 LIST (with 2 breakers)
Cat. No. LV211A. 100 Amp. Service Control Equipment

$23.50 LIST (with 6 breakers)
Cat. No. LD006. Six circuits, 70 Amp. Main.

$30.00 LIST (with 8 breakers)
Cat. No. LE008. Eight circuits, 70 Amp. Main.

$54.90 LIST (with 12 breakers)
Cat. No. LG012. Twelve circuits. 100 Amp. Main.

$90.20 LIST (with 20 breakers)
Cat. No. LK120. Twenty circuits. 100 Amp. Main.

...All Murray Load Centers are listed by Underwriter's Laboratories, Inc.

Take advantage of these low prices. These Murray Load Centers are not only of the highest quality—they are *fully magnetic*. Order from your electrical distributor.

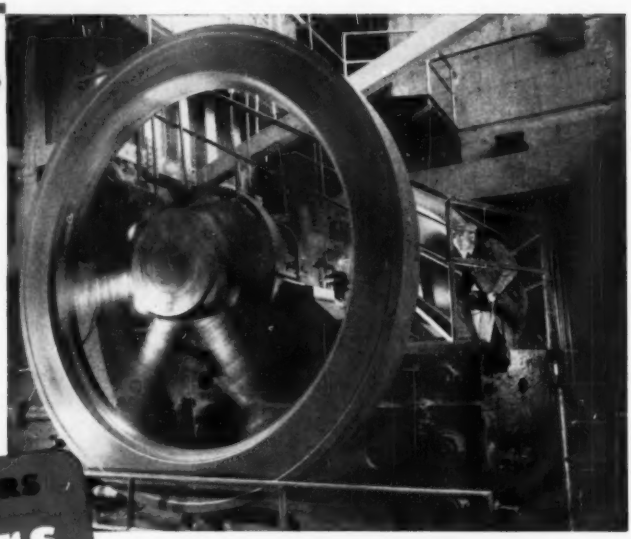
The Murray Load Center was given an Honorary Award for safety in the home by judges representing the National Safety Council, the American Designers Institute, and editors of leading home magazines (1951 Lewis & Conger Annual Home Safety Competition).

Murray®

MURRAY MANUFACTURING CORPORATION
1250 Atlantic Avenue • Brooklyn 16, New York

Service Entrance & Meter Equipment • Magnetic Circuit Breakers • Switches • Current Limiting Reactors • Crows'nest Aerial Ladders

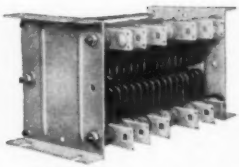
CONTROL *Engineered* to help produce copper



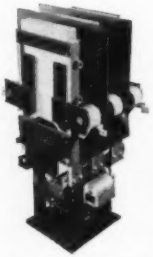
IT TAKES CONTROLLED POWER to process copper ore. Crushing run-of-the-mine ore in this giant jaw crusher, for example, takes a 300-horsepower wound-rotor motor and an Allis-Chalmers Type H Starter engineered especially for extremely high starting inertia and variable loads.

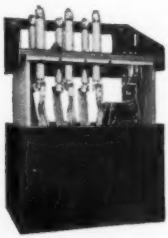
A-3670

THIS STARTER controls the motor to provide smooth acceleration in overcoming the inertia of heavy crusher jaws and large fly wheels. This is accomplished by means of a full automatic starter having six secondary accelerating steps.



EXTRA HEAVY DUTY resistors in the motor secondary circuit provide starting torque and smooth acceleration. Adjustable time delay relays control closing of the accelerating contactors to cut out successive resistor banks . . . automatically bringing the crusher to speed.





SELECTION OF PRIMARY CONTACTORS for every Allis-Chalmers controller is based strictly on job requirements. Allis-Chalmers high voltage starters have either oil-immersed or air-break contactors as standard.

ALLIS-CHALMERS

There are Allis-Chalmers controllers for use in every industry . . . starters for squirrel-cage, wound-rotor and synchronous motors. For starters up to 2500 hp at 5000 volts — check with your A-C representative, or write Allis-Chalmers, Milwaukee 1, Wisconsin for Bulletin 14B6410A.

ELECTRICAL CONSTRUCTION AND MAINTENANCE

Published for electrical contractors, industrial electricians, engineers, consultants, inspectors and motor shops. Covering engineering, installation, repair, maintenance and management, in the field of electrical construction and maintenance.

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APRIL 1952 • Vol. 51, No. 4

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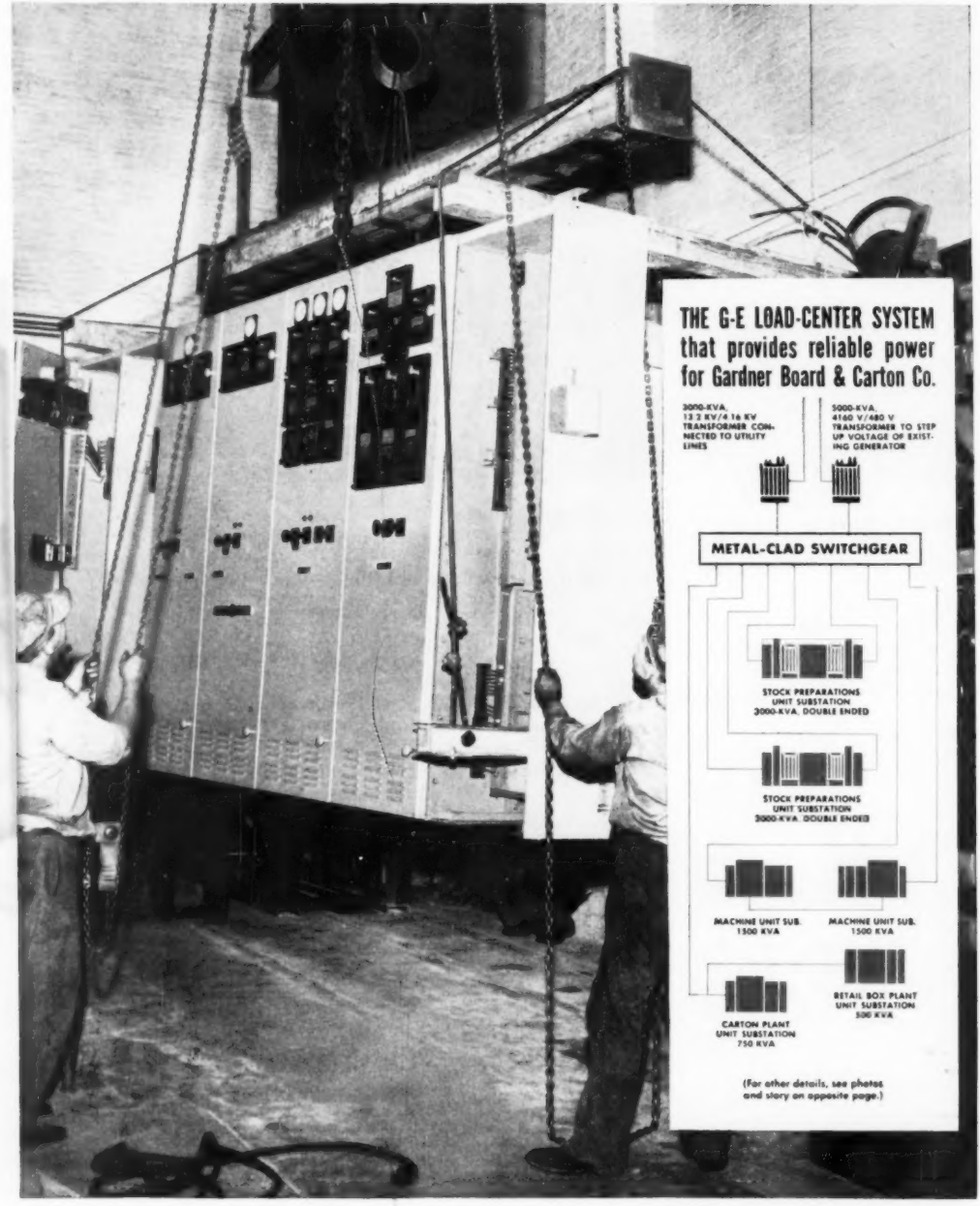
Ohio plant avoids shutdowns with


THE G-E LOAD-CENTER SYSTEM
that provides reliable power
for Gardner Board & Carton Co.
3000-KVA, 13.2 KV/4.16 KV TRANSFORMER CONNECTED TO UTILITY LINES
5000-KVA, 4160 V/480 V TRANSFORMER TO STEP UP VOLTAGE OF EXISTING GENERATOR
METAL-CLAD SWITCHGEAR
STOCK PREPARATIONS UNIT SUBSTATION 2000-KVA, DOUBLE ENDED
STOCK PREPARATIONS UNIT SUBSTATION 2000-KVA, DOUBLE ENDED
MACHINE UNIT SUB. 1500 KVA
MACHINE UNIT SUB. 1500 KVA
RETAIL BOX PLANT UNIT SUBSTATION 500 KVA
CARTON PLANT UNIT SUBSTATION 750 KVA
(For other details, see photos and story on opposite page.)

G-E FACTORY-ASSEMBLED POWER EQUIPMENT IS EASY TO INSTALL. HERE MEN LOWER MAIN SWITCHGEAR SECTION INTO PLACE.

G-E load-center power system

Like many other growing plants, the Gardner Board and Carton Co. found they needed more power. They realized, too, a pressing need for more protection against power-failure shutdown than they had with their old-type 480-volt distribution system.

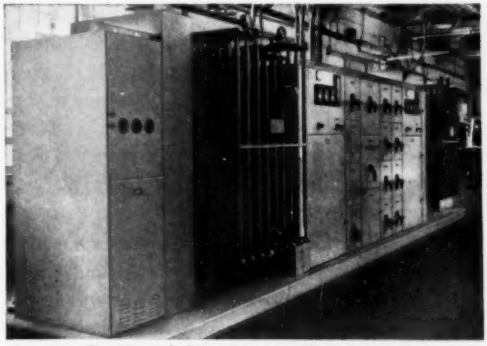
How they did it: With the help of General Electric engineers, Gardner completely replaced their old 480-volt system with a modern 4160-volt G-E load-center system. Compact, metal-enclosed unit substations now give them plenty of power—and plenty of protection against power shutdowns too. A secondary-selective system provides duplicate sources of power for substations supplying the most vital plant loads. Metal-enclosure of all live parts—and modern breakers with plenty of interrupting capacity—give further protection both for production and for plant personnel.

Improves Voltage—Saves Copper—Flexible for Future By taking high-voltage power directly to load centers, long secondary circuits are avoided, and plant voltage improved. The tons of extra copper that would have been required to expand the old 480-volt system were saved. And the plant electric system now has great flexibility for the future. Additional substations can be added easily, quickly, economically. Existing ones can be easily moved to follow load shifts.

For further information on G-E engineered load centers, call on your local G-E sales representative, or write for GEA-3592, General Electric Company, Schenectady 5, N. Y.

G-E "Project Co-ordination" praised by Chief Engineer

"Many costly man-hours were saved for us by G-E over-all co-ordination," says Arthur Harvey, Chief Engineer of Gardner Board and Carton Co. "From planning to final installation, G.E. co-ordinated all equipment and delivery details whereas Gardner men installed the equipment. The effect on our production during this period was negligible." In photo above, Mr. Harvey discusses over-all plan submitted by General Electric with Mr. J. M. Popp, G-E sales engineer. A simple outline of this plan is shown in chart on opposite page.



Compact Double-ended Load-Center Unit installed close to load. Ratings: 3000 kva, 4160/480 v. Drawout breakers are easy to inspect, have plenty of interrupting capacity. Note G-E "Interlocked Armor" cables, which provide metal-enclosed circuits with lower material and installation costs.

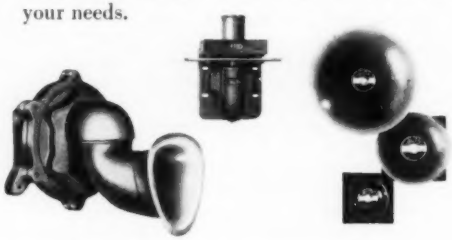
GENERAL ELECTRIC

321-78

How loud a SOUND do you want?

Whichever sound you want, AUTH'S AUDIBLE SIGNALS can fill your bill. There are nonpareil Powerbels for any heavy duty signaling or alarm jobs, where fast-installing, powerful-sounding vibrating or single stroke bells are needed . . . and there are midget buzzers smaller than your belt buckle — precision built, as smooth and soft-sounding to the ear as the purr of a kitten . . . as well as many other AUTH bells, buzzers, chimes, horns and sirens awaiting your selection. You can get the signal you want from AUTH!

Remember, too, that AUTH is your company when you need ***systems*** to signal and communicate, keep correct time, and protect lives and property from fire in schools, hospitals, housing projects and industry. The experience derived from 60 years of research and progressive manufacturing methods in this field is available to you without obligation, if you desire technical help or guidance. Literature, too, is available — please write the Auth Electric Company, Inc., 34-20 Forty-fifth Street, Long Island City 1, New York, and tell us your needs.



Whatever your problem, place your trust in an experienced company; place your faith in a specialist; place your order with AUTH.

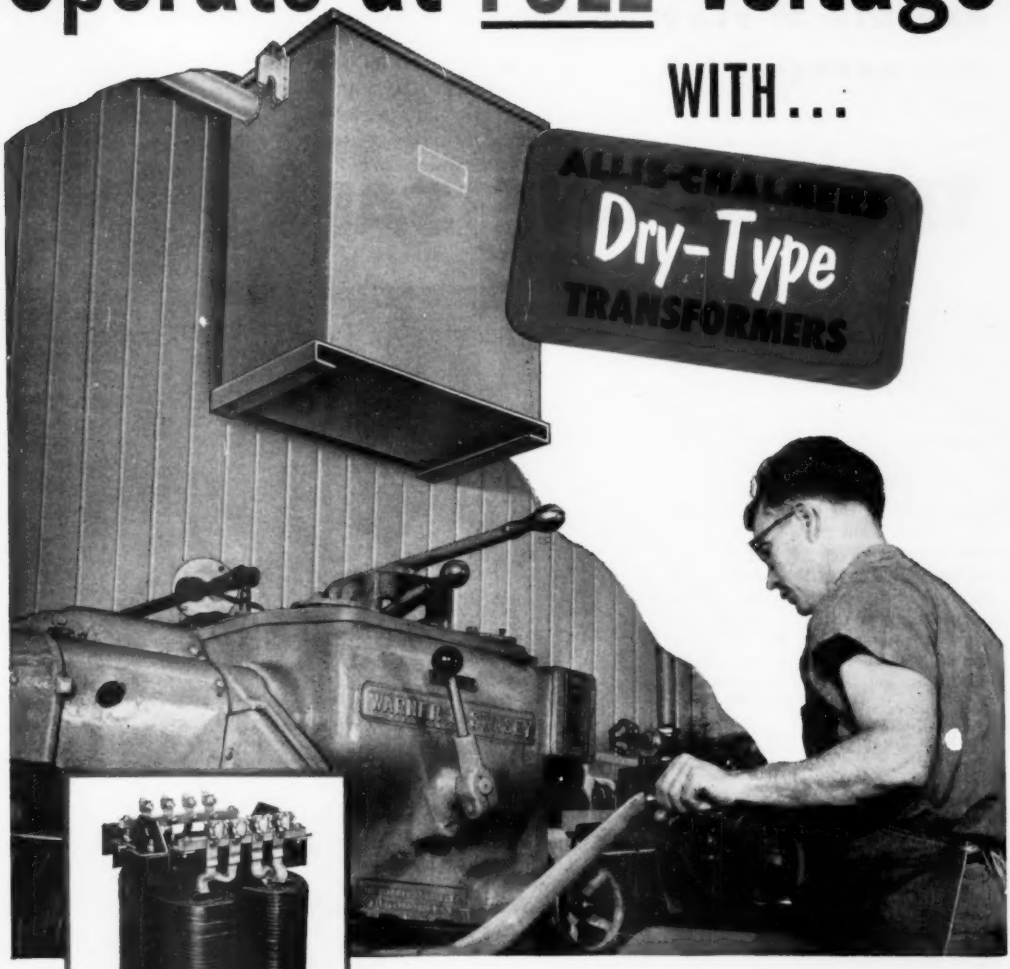
SINCE 1892

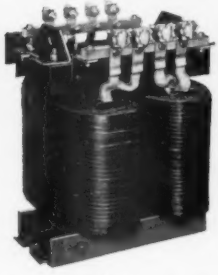
AUTH

FOREMOST IN THE DESIGN AND MANUFACTURE OF ELECTRICAL SIGNALING, COMMUNICATION AND PROTECTIVE EQUIPMENT

Operate at FULL Voltage

WITH...





Time-saving solderless connectors are standard on units 15 through 50 kva, single phase, and 37½ through 100 kva, three phase.

MAXIMUM EFFICIENCY is obtained when motors and other equipment are operated at rated voltage. Allis-Chalmers dry-type transformers installed close to the load provide full voltage for efficient motor operation, bright, flicker-free lights, and full heating of thermal equipment. Long expensive runs of secondary copper are avoided and distribution losses are minimized.

Transformers are easy to mount. Install them on walls, platforms, posts or directly on machines. No expensive fire-proof vaults are needed. Available in a wide range of sizes.

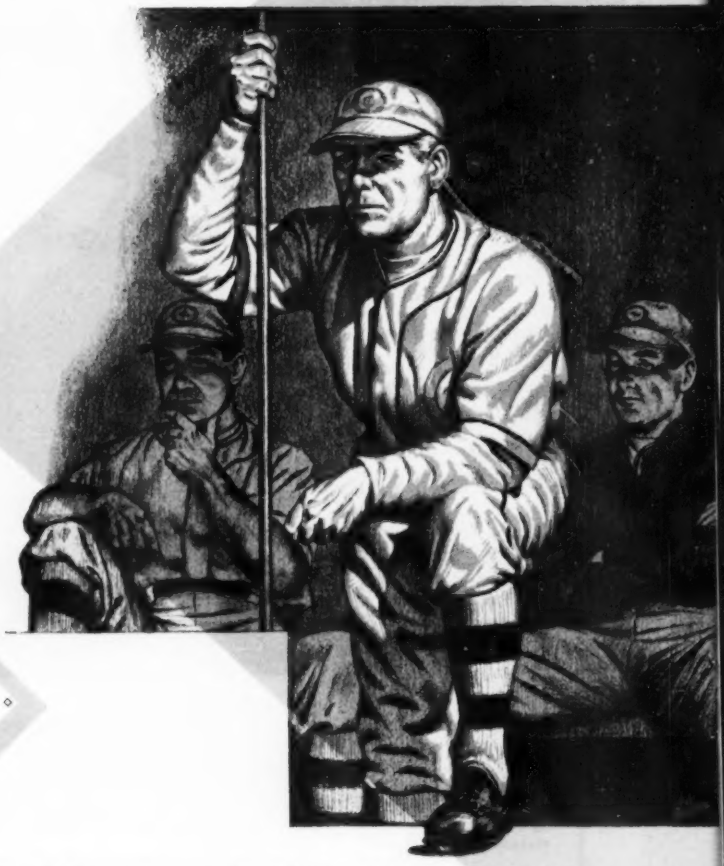
Write Allis-Chalmers, Milwaukee 1, Wis., for bulletin 61B6382A.

A-3609

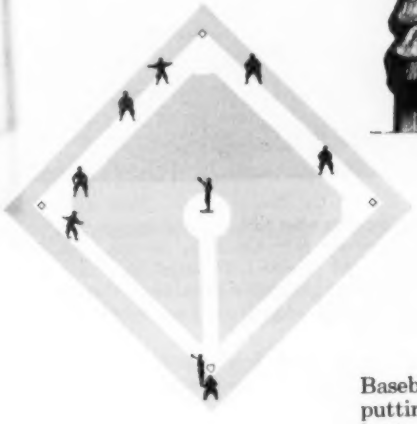
ALLIS-CHALMERS

EXPERTS AT WORK,
EXPERTS AT PLAY,
ALL AGREE:

THERE'S ONE SAFE WAY!

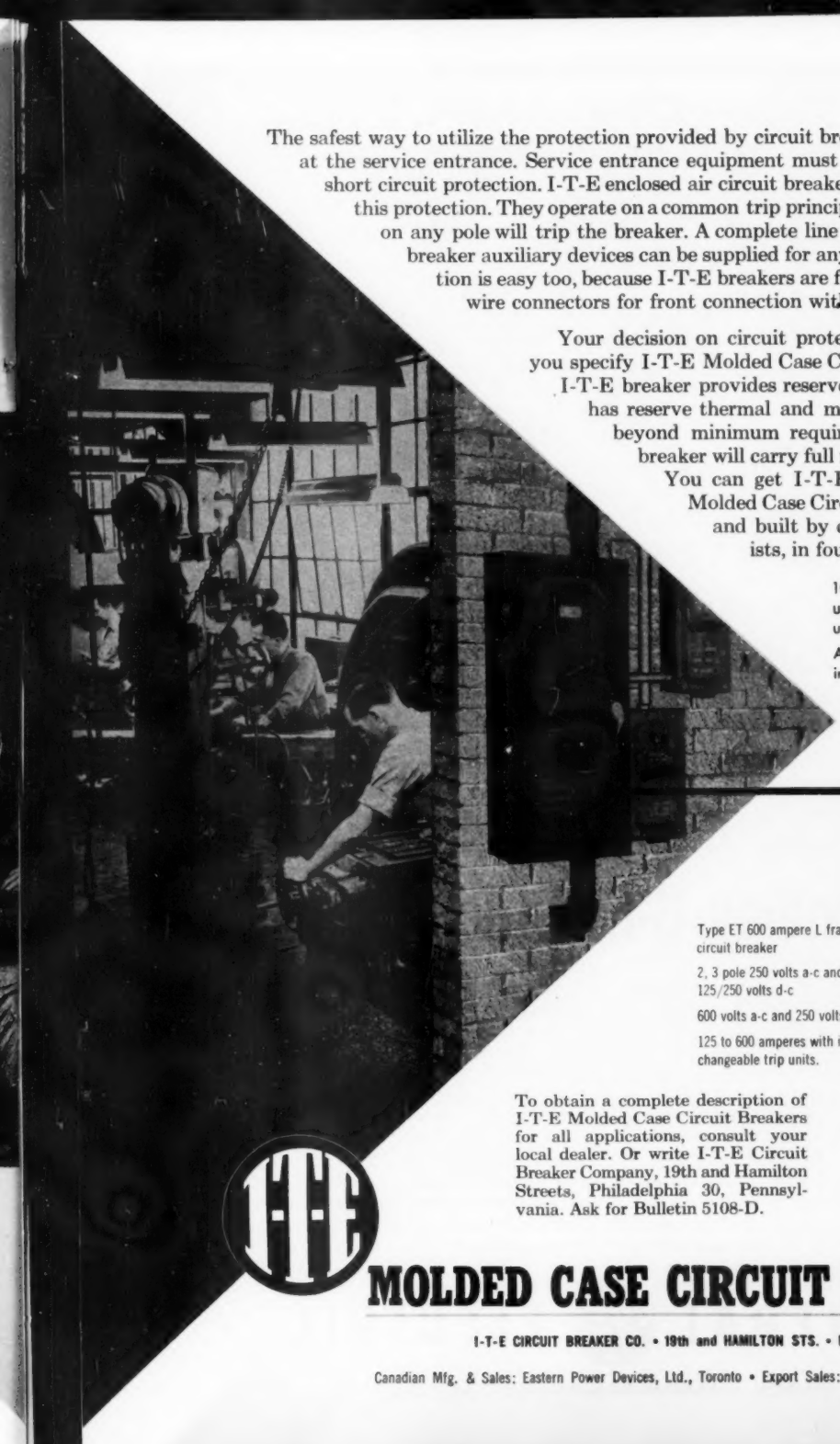


It's the top of the ninth inning and the visiting team trails 4 to 1. After two are out, they get runners on second and third with a single and double. The cleanup batter is approaching the plate. He is the league's leading hitter, but is 0 for 3 for the afternoon. There are several things the home team manager can do, but one is really safe. Do you know which it is?



Baseball experts agree the thing to do is play it safe by putting percentages in your favor and pitching to the batter. Even if he clouts one, the score is only tied. But if you walk him, the potential *winning* run—a dangerous number five hitter—steps to the plate.

Electrical experts agree that you should play it safe when you have a problem in protecting lighting, power and distribution circuits. That means relying on circuit breakers for all-important protection.



The safest way to utilize the protection provided by circuit breakers is to start right at the service entrance. Service entrance equipment must provide overload and short circuit protection. I-T-E enclosed air circuit breakers are designed to give this protection. They operate on a common trip principle so that overcurrent on any pole will trip the breaker. A complete line of internally mounted breaker auxiliary devices can be supplied for any application. Installation is easy too, because I-T-E breakers are furnished with pressure wire connectors for front connection within the breaker frame.

Your decision on circuit protection is a safe one, if you specify I-T-E Molded Case Circuit Breakers. Every I-T-E breaker provides reserve protection because it has reserve thermal and mechanical capacity far beyond minimum requirements. Every I-T-E breaker will carry full rated load indefinitely. You can get I-T-E *individually enclosed* Molded Case Circuit Breakers, designed and built by circuit breaker specialists, in four frame sizes covering:

10 to 600 amperes
up to 600 volts a-c
up to 250 volts d-c

All ratings are available in four types of enclosures.

Type ET 600 ampere L frame circuit breaker

2, 3 pole 250 volts a-c and 125/250 volts d-c

600 volts a-c and 250 volts d-c

125 to 600 amperes with interchangeable trip units.

To obtain a complete description of I-T-E Molded Case Circuit Breakers for all applications, consult your local dealer. Or write I-T-E Circuit Breaker Company, 19th and Hamilton Streets, Philadelphia 30, Pennsylvania. Ask for Bulletin 5108-D.

I-T-E

MOLDED CASE CIRCUIT BREAKERS

I-T-E CIRCUIT BREAKER CO. • 19th and HAMILTON STS. • PHILADELPHIA 30, PA.

Canadian Mfg. & Sales: Eastern Power Devices, Ltd., Toronto • Export Sales: Philips Export Corp., N. Y. 17, N.Y.

OUTDOOR INDUSTRIAL LIGHTING

MODERN OUTDOOR LIGHTING has made this plant storage area as accessible at night as during daytime operations. G-E Type 101-S luminaires with 500 watt multiple incandescent lamps are mounted two per pole at heights of 25 feet, spaced 80 feet apart, providing good outdoor illumination.

Double your plant area's usefulness by providing G-E outdoor lighting

Long ago good management tripled productive capability by providing proper *indoor* lighting—making possible extra work shifts when needed.

Now you can have 'round-the-clock "daytime" whenever you need it *outside* your plant as well as inside, with G-E outdoor lighting.

At relatively small cost, you can actually double the usefulness of your plant area facilities by doubling the time in which men can work there.

For example, in the above photograph, the outdoor area is used for storage of rough castings. When additional work shifts were added, it became necessary to light this storage area so that needed parts might be readily located—regardless of the time of day. (Many plants still on one-shift operation avoid interrupting production by doing all their heavy materials handling at night.)

Moreover, good outdoor lighting will provide protection against pilfering, sabotage and costly accidents.

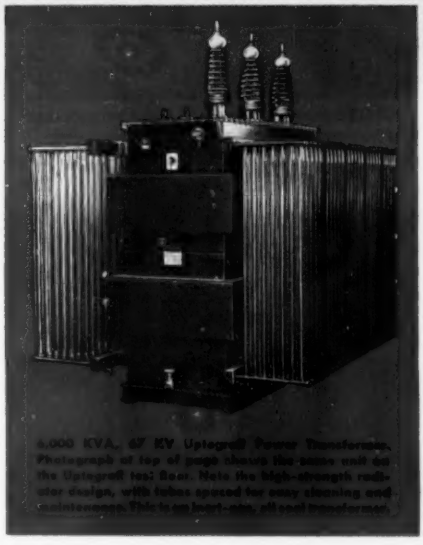
In these and many other ways, your investment in adequate G-E outdoor lighting will pay for itself over and over again. Write for the complete story in GEA-3640, "Outdoor Lighting for Industrial Plants." Address *General Electric Company, Schenectady 5, N. Y.*

GENERAL ELECTRIC

451-168

Uptegraff POWER TRANSFORMERS

Individually DESIGNED, BUILT, TESTED



6,000 KVA., 67 KV Uptegraff Power Transformer. Photograph at top of page shows the same unit on the Uptegraff test floor. Note the high-strength radiator design, with tubes spaced for easy cleaning and maintenance. This is an hermetic, oil seal transformer.

Every Uptegraff Power Transformer is made to exacting standards for quality performance and is thoroughly tested as an individual unit before shipment.

Sensible design and careful construction are combined to insure long life and dependability. Consider these features:

1. Core and coils thoroughly dried and oil impregnated while warm.
2. Super-sensitive electronic leak detection eliminates the smallest leaks in tanks and bushings.
3. All external tank surfaces shot blasted and covered with three coats of enduring paint; bottom of tank is under-coated.

These are just a few of the many details that make dependability.

We can quickly meet your needs with transformers built to your specifications.

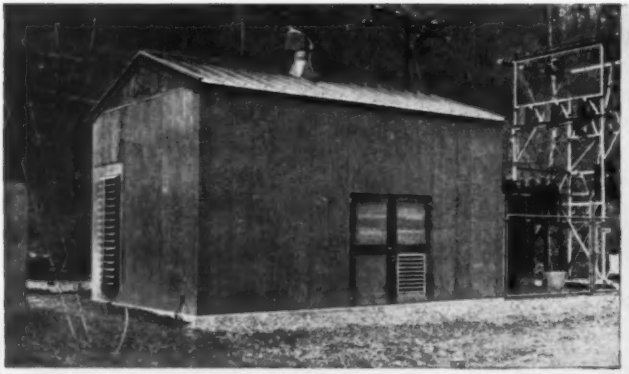
R. E. UPTEGRAFF MANUFACTURING CO.

SCOTTDALE, PENNSYLVANIA

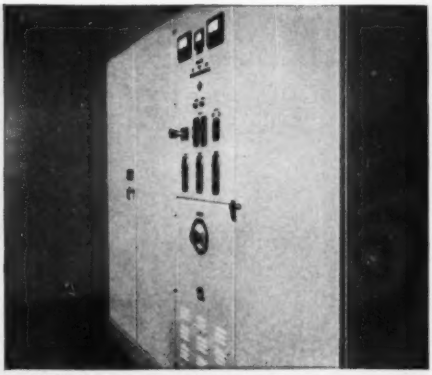
Makers of: POWER • DISTRIBUTION • INSTRUMENT SPECIALTY TRANSFORMERS

Whether Mine . .

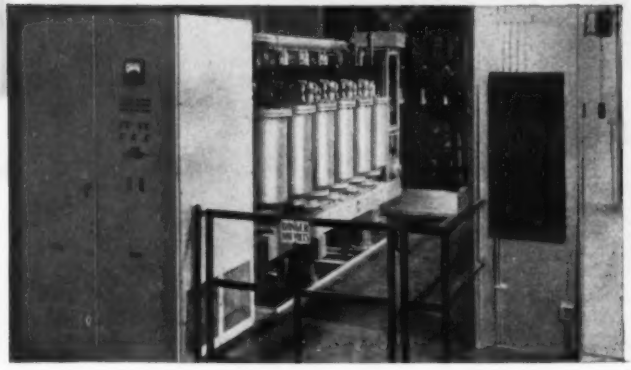
ALLIS-CHALMERS MERCURY ARC RECTIFIERS WITH EXCLUSIVE DESIGN FEATURES CAN SUPPLY YOUR DC NEEDS



OUTSIDE view of one of five Allis-Chalmers rectifier substations serving the haulage system of a coal mining operation. Transmission line enters building at right, dc leaves at left. Entire substation can be moved as coal seams are exhausted, leaving only concrete slab behind.



INSIDE is the "dead front," factory packaged, 500 kw, 275 volt dc, sealed tube rectifier. Compartments are (L to R): for rectifier tubes, firing and auxiliary control, dc cathode breaker.



PUMP evacuated rectifiers are applied in heavy duty service from 750 kw up. The 3400 kw, 500 volt unit seen here operates in parallel with steam turbine driven dc generators in the electrolytic reduction of metal.

SIDE view of pump evacuated rectifier at left, showing the centralized placement of auxiliaries — exclusively Allis-Chalmers. Both evacuation equipment and heat exchanger are accessibly placed at one end.

ALLIS-CHALMERS

Allis-Chalmers Engineers Introduced Mercury Arc Rectifiers to U.S. Industry

. . or Mill!

ALLIS-CHALMERS

MERCURY ARC RECTIFIERS

WHEREVER DC IS NEEDED, from the mine to the mill, from the Elevated to the elevator, Allis-Chalmers rectifiers are quietly working away.

They combine the high efficiency, low maintenance characteristics of the mercury arc rectifier with exclusive A-C refinements in design and construction.

Factory packaged, light in weight, and requiring no special foundation, they can be placed right at the load center to cut dc feeder losses. Conversion efficiency is higher at all loads with large power savings during light load periods.

And in addition, only from Allis-Chalmers can you get rectifiers with these exclusive design refinements:

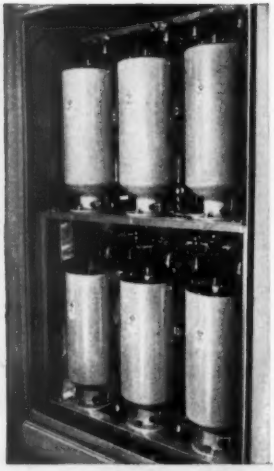
EXCLUSIVE ALLIS-CHALMERS FEATURES

- **Fixed excitation anode** — doesn't contact mercury and is independent of level, turbulence or impurities . . . requiring no adjustment, maintenance or replacement.
- **Continuous excitation** — pilot arc always present, eliminating need for continuous and synchronized re-ignition. Rectifier will ride through severe ac voltage disturbances.
- **Grid phase control** — in cooler and cleaner region near anode, where ion density is lowest.
- **Internal cooling system** — high heat transfer with seamless tube cooling coil located within the rectifier.
- **Arcover-free tank** — eliminates danger of arcing-over to tank by insulating entire arc path.
- **Enamelled anode seals** — multi-layer fused vitreous construction provides high-strength seal, unaffected by thermal variation.

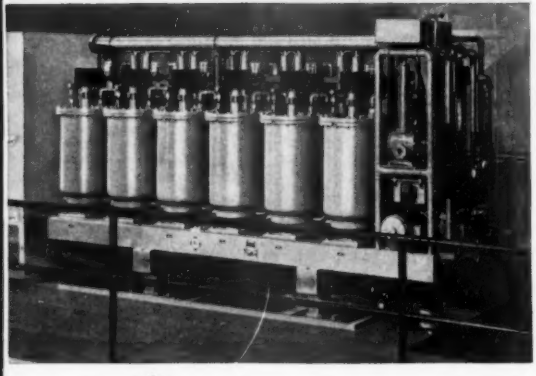
All these design advances are obtainable *only* from Allis-Chalmers. When you consider mercury arc rectifiers in your expansion or modernization planning, consider Allis-Chalmers.

For help with rectifier application and a fuller explanation of exclusive superior features, call your nearest A-C office or write to Allis-Chalmers, Milwaukee 1, Wisconsin.

A-3681



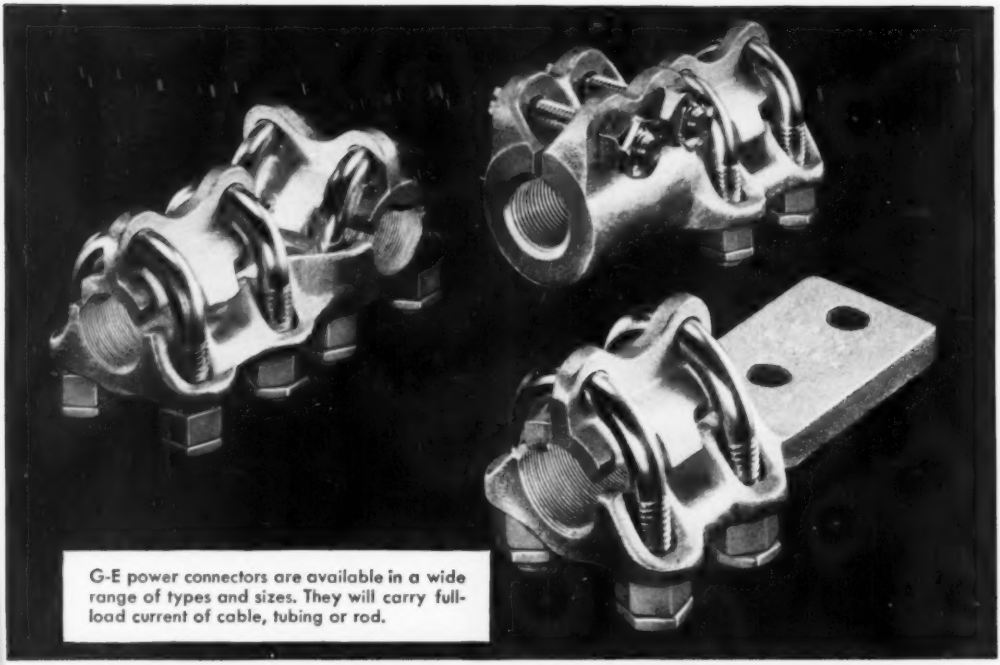
MODERN Allis-Chalmers design sealed tubes are located in the tube compartment. Other sealed tube units are supplied in ratings from 200 to 1000 kw.



10 Mercury Arc Rectifier Advantages:—

★ Compact and light weight ★ No special foundation ★ Push button starting with no synchronizing ★ Quiet operation with high power factor ★ Low idling loss and high conversion efficiency ★ High momentary overload capacity ★ Immunity to frequent short circuits ★ No moving parts, contributing to low maintenance cost ★ No attendance needed during operation ★ Resistant to dust, moisture, fumes ★ Simple construction with long life

A-C ALLIS-CHALMERS



G-E power connectors are available in a wide range of types and sizes. They will carry full-load current of cable, tubing or rod.

Make power connections and forget 'em... when you use G-E Power Connectors!

With G-E power connectors, you get a permanent, high conductivity joint that resists vibration and maintains positive contact with the conductor at all times.

Low contact losses Silver on all current-carrying surfaces minimizes contact resistance—protects against formation of troublesome copper oxide. Interlocking sides confine cable strands within the enclosure, reducing inter-strand resistance. Carefully regulated copper content of connector alloy assures current-carrying ability equal to that of conductor. As a result, G-E connectors "run cool"—preventing oxidation through overheating.

High mechanical strength Sharp, machine-serrated contact surfaces bite into the conductor—providing extremely high pull-out strength and the ability to resist vibration. Noncorrodible hardware of high-strength bronze alloy maintains permanent tightness. G-E power connectors will not twist, distort or season crack.

Types include straight, tee, block, angle, expansion, ground and many others. Why not place a trial order with your G-E sales representative today? Write for Bulletin GEC-400—it contains 44 pages of valuable connector information. General Electric Company, Schenectady 5, N. Y.

856-77

GENERAL ELECTRIC

PARKWAY CABLE

Save the cost of duct systems!...with the most dependable Parkway Cable you can buy!

ROEBLING'S research staff is continually working at the job of product development. Our manufacturing facilities and techniques are constantly improved. That's why our Parkway Cable for distribution and general power supply circuits is today even more dependable than ever before.

Roebling Parkway Cable saves money right from the start because it is buried directly in a shallow, low-cost trench. It is made in single and multiple conductor – solid or stranded – in a range from 600 to 5,000 volts . . . furnished with metallic armor or a non-metallic *Roeprene* sheath, depending on the physical protection required. Types that pass all C.A.A. requirements for Specification No. L-824 for airport lighting are also available.

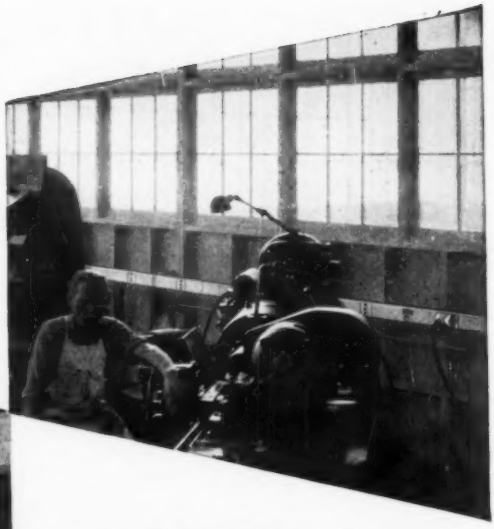
Large quantities of Roebling's full line of electrical wires and cables are needed in the rearmament program. We and our distributors will do everything possible, however, to meet your requirements. John A. Roebling's Sons Company, Trenton 2, N. J.

ROEBLING

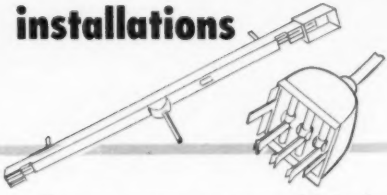
ATLANTA, 934 AVON AVE • BOSTON, 51 SLEEPER ST & 5 PITTSBURGH ST • CHICAGO, 5525 W. ROOSEVELT RD • CINCINNATI, 3253 FREDONIA AVE • CLEVELAND, 701 ST. CLAIR AVE, N. E. • DENVER, 4801 JACKSON ST • DETROIT, 915 FISHER BLDG • HOUSTON, 6216 NAVIGATION BLVD • LOS ANGELES, 5340 E. HARBOR ST & 120 S. HEWITT ST • NEW YORK, 19 RECTOR ST • ODESSA, TEXAS, 1920 E. 2ND ST • PHILADELPHIA, 230 VINE ST • PITTSBURGH 1301 CLARK BLDG • ROCHESTER, 1 FLINT ST • SAN FRANCISCO, 1740 17TH ST • SEATTLE, 900 1ST AVE S. • ST. LOUIS, 3001 DELMAR BLVD • TULSA, 321 N. CHEYENNE ST • EXPORT SALES OFFICE, TRENTON 2, NEW JERSEY

MIDGET SIZE

POWER PLUGIN BUSDUCT



provides "Plug in and Go" Power for smaller installations



Midget Size FA POWER PLUGIN Busduct is the ideal system of power distribution for small machines and other similar plant equipment.

Underwriters' Laboratories approved, this modern system of power distribution provides 60 amp., feeder capacity for 2, 3 or 4 wire systems for ½ to 3 H.P., 240 volt motors, AC or DC with conventional type fuses and 7½ H.P. maximum for motors with dual element fuses.

The 2 and 3 conductor types provide 220 volts single phase or three phase power to motors, while the 4 conductor type provides single or three phase power for motors and 120 volts for machine illumination or small pump motors on return lubrication systems.

Midget Size FA POWER PLUGIN Busduct is only 3½ inches wide and 2 inches deep in size. It is available in five and ten foot sections with plugin outlets every twenty inches thus permitting machines to be moved in and out of production lines without slowing down or delaying operations. Special lengths and closer spacing of outlets are also available for application on production benches and equipment.

Contact your nearest FA representative, listed in Sweet's, or write for Bulletin No. 704, for further information on this economical, flexible system of power distribution.

Frank Adam Electric Co.

P. O. BOX 357 ST. LOUIS 3, MISSOURI

Our 61st Year

Makers of BUSDUCT • PANELBOARDS • SWITCHBOARDS • SERVICE EQUIPMENT • SAFETY SWITCHES • LOAD CENTERS • QUIKHETER

THE TWO E·M·T FITTINGS

THAT ARE EASIER TO USE— SAVE MONEY TOO!

Cross Section Showing Indentations.

Easier to use and neater in appearance, Briegel All-Steel Indenter Fittings not only make stronger connections but also make each job more profitable. Contractors the world over recognize their cost cutting qualities and the fact that they make each wiring job a better job. It is only natural that Briegel Fittings are the most widely used E.M.T. connectors and couplings.

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BM STEEL

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PROVIDE FOR 50% MORE FUTURE LOAD GROWTH WITHOUT USING MORE COPPER OR STEEL ...WITH ROCKBESTOS A.V.C.®

Electrical load requirements of a new building are anticipated during the design stages...but will it be enough years from now.

By simply using Rockbestos A.V.C. on the same size (size for size basis as R or RH), you automatically provide for up to 50% future growth. And remember, you get this important additional current capacity without using any more critical copper or steel.

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...Your best buy

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NEW HAVEN 4, CONNECTICUT
the originators of A. V. C.®
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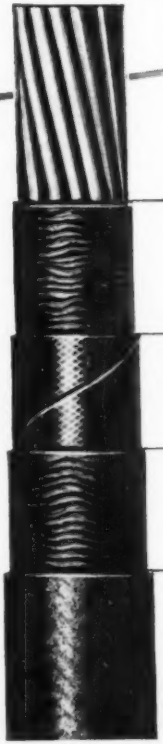

IT'S THE A.V.C. "SANDWICH"
that makes the difference

Inner Felted Asbestos Wall

Varnished Cambric

Outer Felted Asbestos Wall

This "sandwich" protects the varnish cambric. It enables A. V. C. to carry more current than cables with conventional insulations.

–for every wiring need!
Specify ACCURATE TAPES
ACCURATE FRICTION TAPE
ACCURATE FRICTION TAPE
Features the best of material carefully fabricated to provide maximum mechanical protection. Available in Standard and A.S.T.M. grades.
ACCURATE RUBBER TAPE
ACCURATE
ACCURATE tape
Offers high elasticity, high dielectric strength and super aging qualities. Made in both Standard grade and A.S.T.M. – A.A.R. Specification
ACCURATE PLASTIC TAPE
ACCURATE PLASTIC TAPE
Thin caliper plus a combination of good mechanical and dielectric strengths. Recommended for use wherever plastic tape is practical.
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ACCURATE is the choice for HEAVY DUTY TAPING
Every foot of Accurate Specification tape exceeds the standards required. Friction or rubber, you can count on Accurate easier, faster taping with utmost confidence in its protective qualities.
for the electrical industry are manufactured to precision standards by men who have devoted a lifetime to producing tapes of superior quality. Every foot is carefully made and constantly inspected to assure uniform high quality. The sure way to complete tape satisfaction is to specify ACCURATE by name — every time. Get all the facts on ACCURATE Tape now! Just call or write the Accurate Manufacturing Company, Garfield, New Jersey, for new illustrated literature which includes complete specifications and technical data covering the entire ACCURATE line of quality tapes. There is no obligation.
ACCURATE your best buy in tape
MORE THAN A QUARTER CENTURY OF TAPE SPECIALIZATION
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Superintendent says "G-E motor

MOST WORK IN THIS MILL IS SPECIAL. G-E STARTERS

REPORTS HARD USAGE,

"About the best production 'insurance' we have," says Mr. Harry F. Rubert, Mill Superintendent of the Beetem Lumber and Manufacturing Company, "is our G-E motor starters.

"We can't afford shut-downs due to burned-out motors which have been overloaded. Not only that, but we must take every precaution against fire.

"In our search for something safe and foolproof to do the job, we decided G-E starters were our best bet.

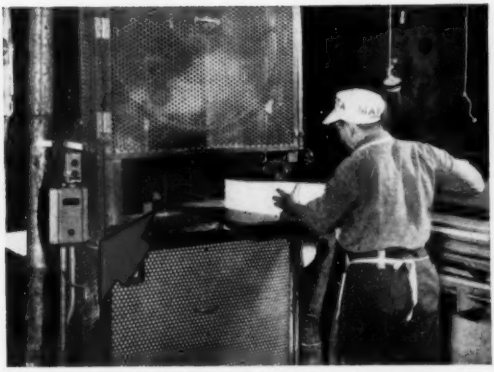
IN CONSTANT USE, this 15-hp, 208/220-volt G-E magnetic motor starter protects motor on a "sticker" machine.

EXCLUSIVE STRONGBOX COIL can't be damaged by slipping screwdriver—only tool needed for maintenance.

GENERAL ELECTRIC

730-16

starters protect production!"



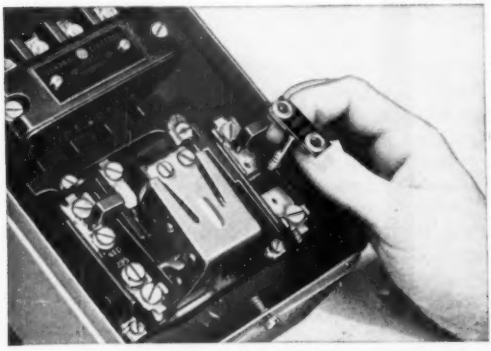
SHOWN OPERATE AND PROTECT MOTORS ON MORTISER (5 HP), RIP SAW (15 HP) AND BAND SAW (5 HP).

EASY MAINTENANCE

We've got them all over the plant now—and believe me, they get plenty of hard use because our machines are on 'stop-and-go' all the time doing special jobs, and with various loads.

"We've used G-E starters more than three years, and I'll say they are great. They're very easy to install. Maintenance is no problem at all, and they definitely protect production by preventing costly shut-downs."

RIGHT OFF THE SHELF! You can get many models of G-E starters right now from your G-E representative or authorized distributor—in NEMA sizes 0, 1, 2 and 3 for motors up to 50 hp. For more information on magnetic starters, write for bulletin GEA-5153; on manual starters, bulletin GEA-1522. Address *Section 730-36, General Electric Co., Schenectady 5, N. Y.*



ONLY TWO SCREWS need be removed to install isothermic overload relay to match protection to the motor.

LOOK FOR THIS LABEL **next time you buy a motor starter—easy to read, it has all the information you need to make certain you've got the right starter for the job you want done. Remember—many different ratings are available right from stock.**

GENERAL ELECTRIC Control

MAGNETIC STARTER
CR 7006 D101B3

15 HP (MAX) 208/220 V 3 PH 60 CY

GENERAL PURPOSE TYPE 1 CASE SIZE 2
FOR USE WITH SEPARATE PUSH BUTTON STATION
H.P. 151014 QTY 1 WT 26 LB

SCHENECTADY, N.Y. MADE IN U.S.A.

Wagner
ELECTRIC MOTORS
...the choice of leaders in industry

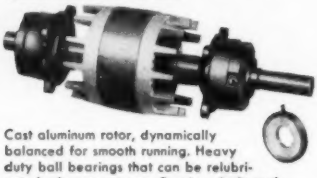
Wagner
CAST IRON FRAME MOTORS
resist corrosion...

Wagner cast iron motors are built for use in chemical plants, oil fields, refineries, steel mills—wherever protection against corrosion is a required feature. They are totally-enclosed and fan-cooled to fully protect their operation against corrosive agents, dirt and dust.

Where additional protection against explosive atmospheres is desired, an explosion-proof design (type JP) is available. Both the standard (type EP) and the explosion-proof types are built in ratings from 2 to 250 hp, with either normal or high torque characteristics. Wagner Bulletin MU-132 gives complete information on these corrosion-resistant motors. Write for your copy today.

features like these give extra protection—

Frame of rugged cast iron. Completely protected laminations. Special varnish treated windings. Cast iron gasket-sealed conduit box.



Cast aluminum rotor, dynamically balanced for smooth running. Heavy duty ball bearings that can be relubricated when necessary. Running shaft seal.

Cast iron endplates, ribbed to add extra mechanical strength.

Externally mounted blower of corrosion-resistant material—malleable iron on type EP, non-sparking bronze on type JP.

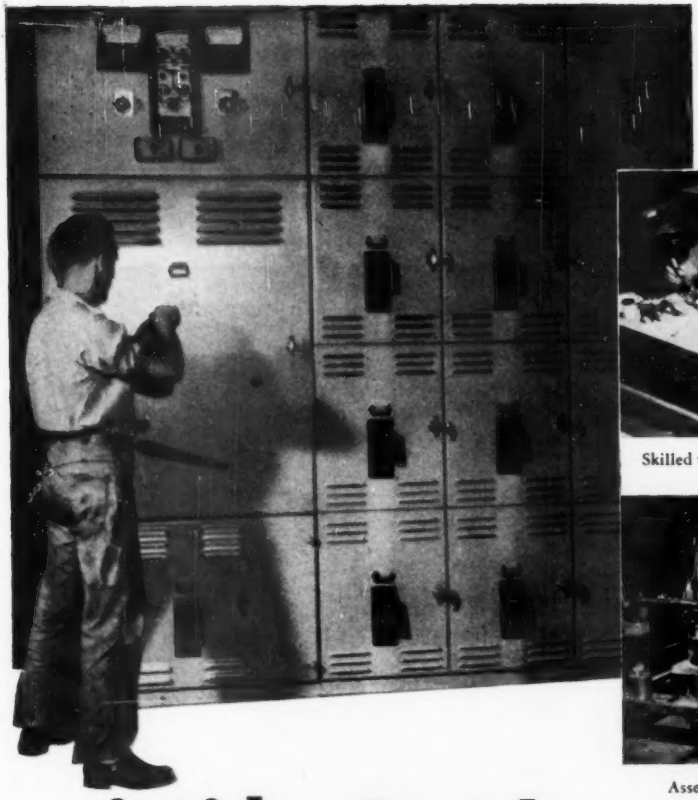
WAGNER ELECTRIC CORPORATION
6413 Plymouth Ave., St. Louis 14, Mo., U.S.A.

® Wagner Electric Corporation EST. WE 1891

ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES
AUTOMOTIVE BRAKE SYSTEMS — AIR AND HYDRAULIC

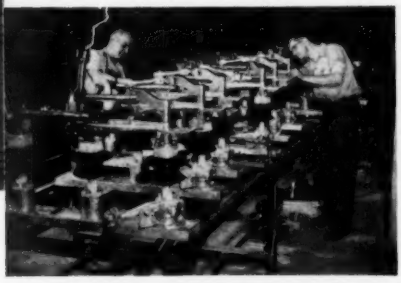
BRANCHES IN 32 PRINCIPAL CITIES

M52-8



Final assembly of custom-built, low voltage, metal-clad switchgear.

Skilled workers assemble precision instruments.



Assembling Duo-Roll air break switches.

inside story!

Last April we opened an additional plant in Bethlehem, Pennsylvania. It is not only our newest but our largest. Because of this, we've been able to greatly increase our production of the precision-designed, dependable electrical equipment for which Roller-Smith and Elpeco have been noted since the early 1900's. We are happy to be in a position to supply increased amounts of equipment at a time when it is so badly needed and do it in a relatively short time. Despite universal material shortages and our greatly increased production you can be sure, that we . . . on the "inside" . . . are maintaining our same high standard of quality. If you need superior electrical equipment, either for yourself or as part of a defense order, contact us at once. We can't promise everything you might need, but perhaps we can help solve some of your particular problems in a surprisingly short time.

Workman wiring large air circuit breaker.

ROLLER-SMITH

ELPECO

ROLLER-SMITH CORPORATION
BETHLEHEM, PA.

NOW... revolutionary new AC

Amazingly smaller to match motor control cases, size for size

Order your Cutler-Hammer AC Motor-Circuit Safety Switches by Catalog Number

230 VOLTS AC—FUSIBLE				575 VOLTS AC—FUSIBLE			
H.P.	FUSE CLIPS	POLES	CATALOG NO.	H.P.	FUSE CLIPS	POLES	CATALOG NO.
3	30A	3	4110-H301	7½	30A	3	4110-H311
7½	60A	3	4110-H302	20	60A	3	4110-H312
15	100A	3	4110-H303	30	100A	3	4110-H313
30	200A	3	4110-H304	50	200A	3	4110-H314
3	30A	4	4110-H401	7½	30A	4	4110-H411
10	60A	4	4110-H402	20	60A	4	4110-H412
20	100A	4	4110-H403	30	100A	4	4110-H413
30	200A	4	4110-H404	50	200A	4	4110-H414

Another Cutler-Hammer "FIRST"

CUTLER-HAMMER
SAFETY SWITCHES
C-H

Another Cutler-Hammer "EXCLUSIVE"

Motor-Circuit Safety Switches

Amazingly better to match dependable performance of motor control

Motor-circuit safety switches, invariably much larger than the motor control enclosures with which they have been used, have long created difficult installation problems. Even when space was available, their bulk and weight made mounting difficult and the much larger size in such close relation to an associated control enclosure, detracted from appearance. Cutler-Hammer engineering has ended all this as far as AC motors are concerned. The new and exclusively Cutler-Hammer Bulletin 4110 line of Horsepower Rated AC Motor-Circuit Safety Switches matches safety switch and motor control in size, convenience, and dependability. Available *now* in ratings from 3 H.P. to 30 H.P., 3 or 4 poles, for 230 Volts AC . . . and in ratings from 7½ H.P. to 50 H.P., 3 or 4 poles, for 575 Volts AC. Inspect these *better* switches now and *see* their many features. Front side operated. Quick make and break. Simple release cover-interlock. Provision for 3 padlocks in "OFF" and 1 padlock in "ON" positions. Unit pole construction. Non-welding butt type totally enclosed sintered silver contacts. Silver plated current carrying parts. Positive-pressure type fuse clips. Solderless connectors. NEMA 1 enclosure. Complete switch assembly on panel removable for easy installation and wiring. Adequate and convenient knockouts. Cutler-Hammer quality and advanced engineering at no extra cost. Order by catalog number as shown in table. These switches have no substitutes even remotely comparable. Your Cutler-Hammer Authorized Distributor can supply you. CUTLER-HAMMER, Inc., 1306 St. Paul Avenue, Milwaukee 1, Wisconsin.

The "works" come out, as a unit, simply by removing 4 screws. Removable mounting base and conveniently located knockouts make installation easy and quick. All parts readily accessible.

SIZE COMPARISON

THREE POLE SWITCHES	WIDTH	HEIGHT	AREA SQ. IN.
Typical Safety Switch 575V 200A	**15¼"**	**32⅝"**	**497**
C-H No. 4110-H314 50 HP 575V 200A	10⅝"	17⅞"	190
Saving in inches	**4⅝"**	**14¾"**	**307**
Saving in percent	**30%**	**45%**	**62%**
Typical Safety Switch 230V 200A	**15¼"**	**30⅛"**	**460**
C-H No. 4110-H304 30 HP 230V 200A	10⅝"	15⅜"	164
Saving in inches	**4⅝"**	**14¾"**	**296**
Saving in percent	**30%**	**45%**	**64%**
Typical Safety Switch 575V 100A	**12⅞"**	**23¼"**	**300**
C-H No. 4110-H313 30 HP 575V 100A	8½"	14¼"	121
Saving in inches	**4⅜"**	**9"**	**179**
Saving in percent	**34%**	**39%**	**60%**
Typical Safety Switch 230V 100A	**12⅞"**	**21¼"**	**274**
C-H No. 4110-H303 15 HP 230V 100A	8½"	12¼"	104
Saving in inches	**4⅜"**	**9"**	**170**
Saving in percent	**34%**	**42%**	**62%**
Typical Safety Switch 575V 60A	**10⅝"**	**17½"**	**186**
C-H No. 4110-H312 20 HP 575V 60A	7¼"	10⅞"	79
Saving in inches	**3⅜"**	**6⅝"**	**107**
Saving in percent	**32%**	**38%**	**58%**
Typical Safety Switch 230V 60A	**10⅝"**	**15"**	**159**
C-H No. 4110-H302 7½ HP 230V 60A	7¼"	8⅜"	61
Saving in inches	**3⅜"**	**6⅝"**	**98**
Saving in percent	**32%**	**44%**	**62%**
Typical Safety Switch 575V 30A	**9⅜"**	**13⅝"**	**128**
C-H No. 4110-H311 7½ HP 575V 30A	7¼"	10⅞"	79
Saving in inches	**2⅛"**	**2¾"**	**49**
Saving in percent	**33%**	**20%**	**39%**
Typical Safety Switch 230V 30A	**8⅛"**	**9⅞"**	**80**
C-H No. 4110-H301 3 HP 230V 30A	7¼"	7¾"	56
Saving in inches	**⅞"**	**2⅛"**	**24**
Saving in percent	**19%**	**22%**	**30%**

SORGEL AIR-COOLED DRY-TYPE TRANSFORMERS

Sub-Stations and Power Centers

for indoor installations

Engineered to meet your exact requirements

Not necessary to design or change your installation to fit a "standard"

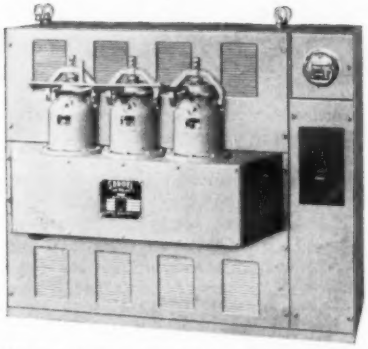
Any type of primary switch gear, Metering—primary or secondary, to suit. Secondary breakers, main, branch, or tie.

Interlocked or automatic throw-over. Draw-out or stationary types. Magnetic trip, or thermal, or combination.

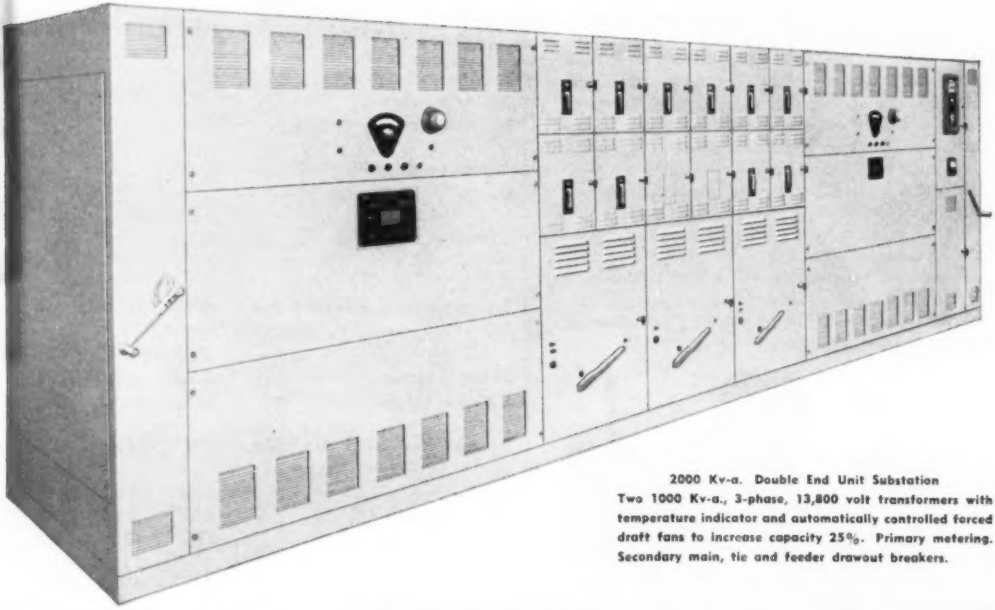
All incorporated with high quality, liberally designed **SORGEL Air-Cooled Transformers.**

All factory wired, tested and assembled. Mounted on a substantial steel base. Shipped as a single unit or in sections, accurately co-ordinated for easy assembly on the job.

Sizes up to 2000 Kv-a. All voltages up to 15 KV.



200 Kv-a. 3-phase, 4160 volt transformer equipped with G & W primary oil fuse cutouts. Secondary circuit breaker and K.W.H. meter.



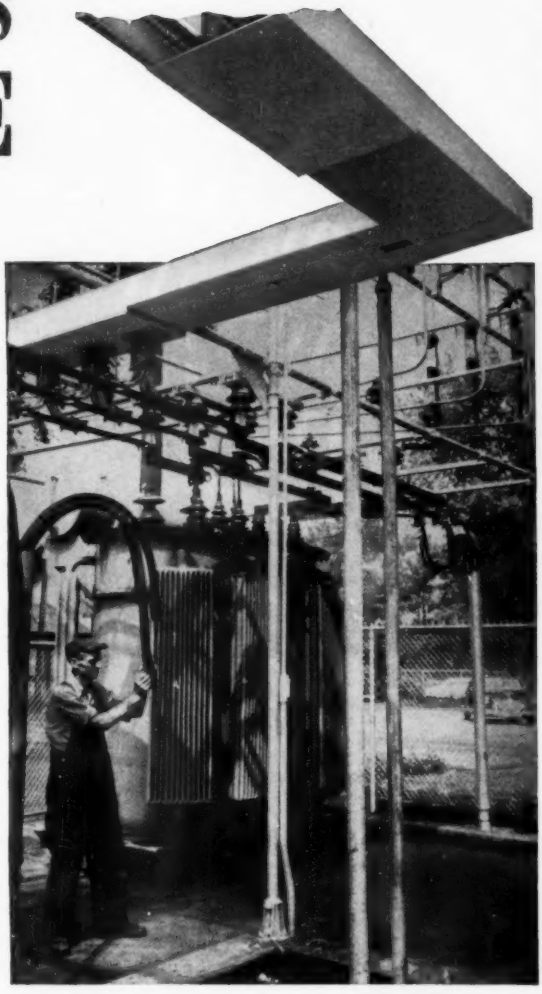
2000 Kv-a. Double End Unit Substation
Two 1000 Kv-a., 3-phase, 13,800 volt transformers with temperature indicator and automatically controlled forced draft fans to increase capacity 25%. Primary metering. Secondary main, tie and feeder drawout breakers.

Sales Engineers in Principal Cities

SORGEL ELECTRIC CO., 836 West National Ave., Milwaukee 4, Wis.

Pioneers in the development and manufacturing of Air-Cooled transformers

BUS DUCT IS FLEXIBLE



Modernize now or you may have to improvise later

Pound for pound, Westinghouse Bus Duct delivers more power than comparably rated systems of wiring, cable or conduit. And—the longer the run, the greater the saving.

As one large manufacturer in the metal working industry said: "We found a tremendous saving in the materials purchased, to say nothing of the far lower labor cost for installation. Wire and conduit alone would have exceeded the cost of the Westinghouse Bus Duct installation. We also found in Westinghouse Bus Duct the flexibility we just had to have in running power from floor to floor".

The 4,000-ampere duct illustrated is part of a 1,200-foot system installed with the addition of new automatic machinery to the production line.

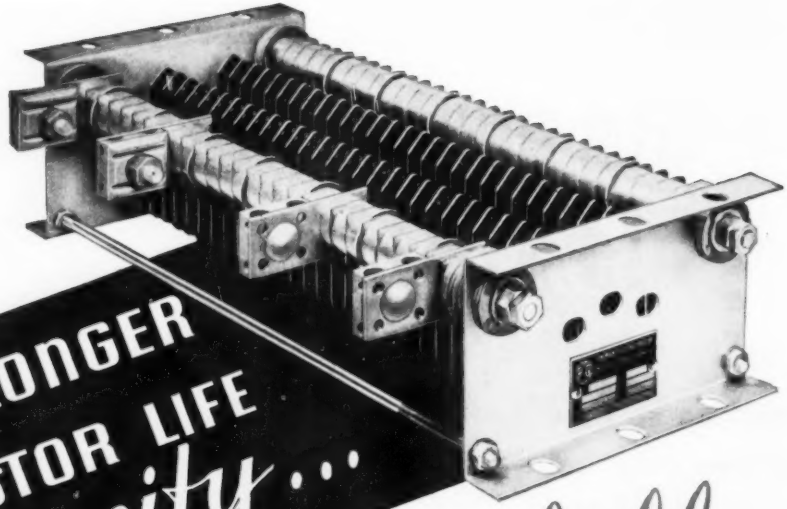
Plug-in receptacles every foot of plug-in duct speed machine tie-ins, simplify change-overs or line expansions.

For details on further advantages, call your nearest Westinghouse representative, or write for Manual B-4272-A, Westinghouse Electric Corporation, Box 868, Pittsburgh 30, Pa. J-30061

Westinghouse 4,000-ampere Weatherproof Low-Impedance Bus Duct connected to 480-volt buses of 1,500-kva transformers. 2,400-ampere cables are being disconnected.

YOU CAN BE SURE.. IF IT'S Westinghouse

BUS DUCT



FOR LONGER RESISTOR LIFE *Specify . . .*

Nonbreakable

P-G STEEL GRID RESISTORS

Longer resistor life as afforded by P-G is the result of exclusive features of design coupled with use of the most durable raw materials.

Grid plates are shaped for maximum ventilation and heat dissipation with tests showing unusually even temperatures over the entire working surface. Thus, "hot spots" one source of resistor trouble, are eliminated.

Unique methods used to mount grid plates in their supporting assemblies is equally important to long resistor life. P-G "floating bolt" construction allows the resistor to expand as operating temperature builds up. Thus damage from expansion, another source of resistor trouble, is minimized.

These and similar practical features of design, plus Steel and Mica as basic materials make P-G the answer for longer resistor life. Ask for Bulletin No. 500E for more detailed information.

P-G

The Nonbreakable Steel Grid Resistor

THE POST-GLOVER ELECTRIC COMPANY

• ESTABLISHED 1892 •

221 WEST THIRD STREET, CINCINNATI 2, OHIO

That's All the Cleaning an Allis-Chalmers TEFC Motor Ever Needs

MAINTENANCE COSTS ARE LOW for users of Allis-Chalmers Totally-Enclosed, Fan-Cooled Motors. They are easy to clean because even the stickiest dirt can be wiped or blown off without dismantling the motor or even stopping it. They seldom require cleaning because cooling air flows over the *outside* of the motor. There are no external concealed air passages to clog up and cause over-heating. You get better operational continuity, lower maintenance.

Bearings Save Maintenance, Too

Double-shielded ball bearings require no regular maintenance under most normal operating conditions. Yet if difficult service makes re-lubrication desirable, it can be done without dismantling the motor or bearings. Rigid cast iron frame and stiff end brackets maintain bearing alignment . . . assure maximum bearing life.

A-3639

Texrope and *Vari-Pitch* are Allis-Chalmers Trademarks.

ALLIS-CHALMERS

Get The Full Story Now

Your Allis-Chalmers Authorized Dealer or District Office can give you complete information on Allis-Chalmers Totally-Enclosed, Fan-Cooled Motors and how they can save you money. Call one of them today or write Allis-Chalmers, Milwaukee 1, Wisconsin. Ask for Bulletin 51B7225.

Sold . . Applied . . Serviced . .

by Allis-Chalmers Authorized Dealers, Certified Service Shops and Sales Offices throughout the country.

CONTROL — Manual, magnetic and combination starters; push button stations and components for complete control systems.

TEXROPE — Belts in all sizes and sections, standard and *Vari-Pitch* sheaves, speed changers.

PUMPS — Integral motor and coupled types from ¾ in. to 72 in. discharge and up.

WESTINGHOUSE
RESET
DO NOT LUBRICATE
Life-Linestarter
PAIRED FOR PRODUCTION
Life-Line motor

STOP costly down time with this pair

"Down-time minutes" can mean a loss of hundreds of units or thousands of dollars. Here's a production team—the best defense against down time—Life-Line motors and Life-Linestarters®. They're paired for production.

Advanced design of these two has eliminated common troubles. Look at the features that make it possible:

Life-Line motor

Steel frame... adds strength, cuts weight.

Pre-lubricated bearings... no greasing.

Improved windings... protected by tough Thermoset varnish, add electrical life.

Life-Linestarter

Bimetallic disc... calibration unaffected by aging or oxidation.

Servicing is simple... all parts front removable.

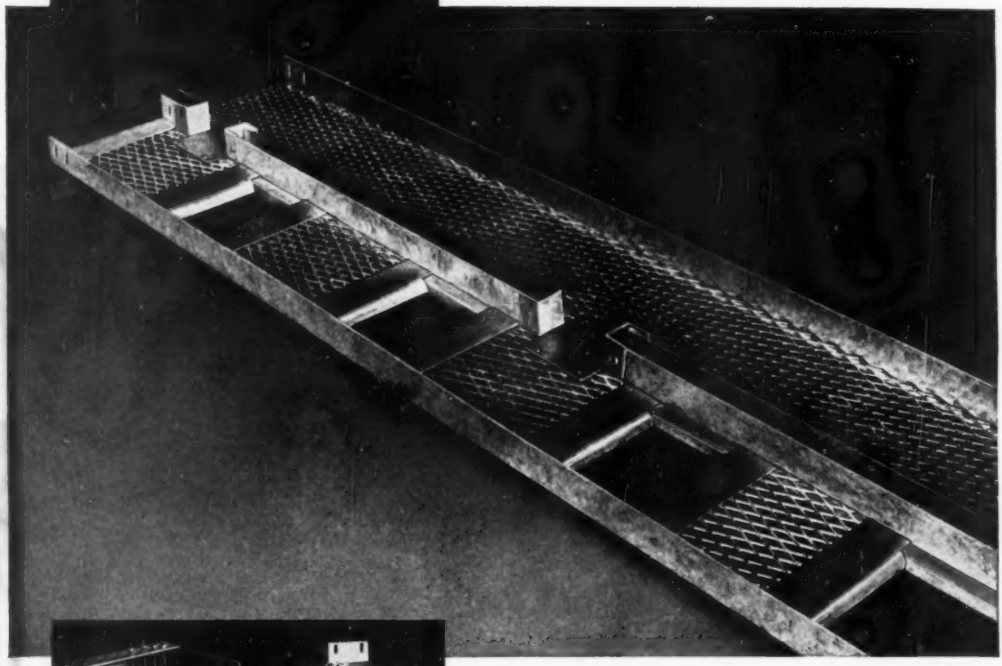
Screw driver only tool required.

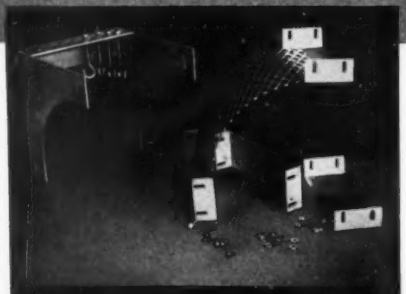
Get these two dependable performers—paired for production—and stop costly down time. For complete information, ask your Westinghouse representative for "Life-Line Motor Book", B-3842 and "Tomorrow's Starter Today", B-4677, or write direct to Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-21639

YOU CAN BE SURE.. IF IT'S
Westinghouse
Life-Line
MOTORS and CONTROLS

This message is for you...

HAVING UNUSUAL PROBLEMS WHICH REQUIRE SPECIAL DESIGNS OF CABLE TROUGH





T.J. Cope INC.

YOU KNOW COPE BY THESE PRODUCTS

There are many cases where installation of cable trough creates this "puzzling problem": *How* should it be designed to fit a particular situation?

That needn't cause you any worry, though, because Cope is solving such individual problems daily. Where a Design Engineer is concerned over a "perplexing situation", all he has to do is outline the problem to our Engineering Staff, and the solution comes from us. Cope Engineers design special fittings which adapt the standard Troughs to your specified job.

We offer you the services of our Engineers when special fittings are required, and urge you to submit your problems to us.

You will quickly discover—as have hundreds of users—that the new Cope Cable Trough with its simplified design actually saves you *three ways*: material, labor and costs.

Request full information on Cope Cable Trough from us today.

T. J. COPE, INC., 711 SOUTH 50th ST.
PHILADELPHIA 43, PENNSYLVANIA

Where you will find THE REAL REVOLUTION

"If we keep in mind the values of opportunity, competition, democracy, productivity, then it is our capitalist society which is the truly revolutionary one – the only society which offers true hope to the masses for release from the long nightmares of tyranny. It is we, not the Marxists with their reactionary ideas of the good dictator, who have the truly constructive, the truly revolutionary ideal."

– from "Capitalism" by David McCord Wright.

If we can only win recognition of this truth, we shall win the struggle of free men against communism. This editorial discusses some of the hurdles that must be cleared.

To win the needed recognition that "our capitalistic society... is the truly revolutionary one," we must keep pounding away both abroad and at home. That is because the communists simultaneously attack us on an international front and try to undermine us from within.

The present drive to rearm ourselves and our allies is crucial to our self-protection on the international front. We must be prepared to meet the armed force of aggressive communism with armed force if we are to secure our physical freedom.

Arms are not enough

But to re-establish parity in arms is only half of the battle. In the last analysis it is not the more important half. To be effective, our arms must be backed by loyalty of men to our ideals. So, both abroad and at home, we must win men to the faith that we do have "the truly constructive, the truly revolutionary ideal."

On the international front, the effort to win adherence to such faith in our capitalist society meets tough going. That arises from the fact that in some of the countries that are allied with us in the fight against communism, capitalist society has offered to its people no such ideal. In varying degrees "the values of opportunity, competition, democracy, productivity" – those key aspects of American capitalism–are either absent or subordinated in their economic life. Indeed, the *Wall Street Journal* recently remarked that "to the European, capitalism has become synonymous with cartels – and with the disregard cartels foster for the consumer, the worker and the over-all well-being of the nation's economy."

No Simple Solution

Nonetheless, many European labor and governmental leaders sincerely believe that cartels are essential to their economic salvation. They believe that without such restrictions in congested European markets there would be intolerable cut-throat competition and instability of employment. Thus, when we point out that the cartel capitalism so prevalent in Europe lacks the constructive qualities of competitive American capitalism, we may offend European leaders whose wholehearted cooperation we need in the fight against communism.

But, if we soft-pedal that contrast, we sacrifice the opportunity to win understanding and loyalty from millions of Europeans who have had no chance to learn that capitalism can be the constructive and liberalizing force that it is in the United States. Indeed, when many of these millions embrace socialism it is not because they love it. They are rather desperately seeking a tolerable middle course between what they consider the hateful extremes of communism and the undesirable aspects of capitalism as they understand it.

New name not the answer

We know that there is no easy way to handle the problems created by such misunderstanding of American capitalism. Neither do we share the belief that much of the difficulty would be overcome if we were to call American capitalism by some other name. By doing that, the argument runs, we shall relieve it from the unpleasant connotations that are attached to the word capitalism in some other parts of the world. But, after all, if we are to give up all the terms that have come to mean something else in other parts of the world, we must begin by ditching the term "democracy" which, in the official jargon of the Kremlin, seems to mean what we call dictatorship.

In spite of the difficulties, however, we must stick to this job of exporting the truth that our capitalist system does offer opportunity, competition and democracy. We must let the rest of the world see that it means a continuous drive for increased productivity, and the search for profits by increasing sales and consumption, not by trying to sell less for more.

Export alone not enough

The spreading of truth about American capitalism will not be effective if it is merely directed abroad. Unless it is carried on at home also, it will lack the driving faith that is essential to any convincing export of this type. Nor will export alone come to grips with the communist attack on our country from within—an attack that gets too much help from loyal Americans who short-sightedly repudiate the basic principles of our institutions in their efforts to reform some of their deficiencies. For success both at home and abroad, we must have right here at home a much more militant recognition that it is in fact our capitalist society which offers "the truly constructive, the truly revolutionary ideal."

Here at home, too, this raises difficult complications. Businessmen who are among the leaders and principal practitioners of capitalism, have generally been catalogued as conservatives. Hence, many people must stretch their imaginations a bit to see that businessmen are leaders of a development which has so greatly and so rapidly improved the lot of free men in America that it is truly revolutionary.

These difficulties of definition, however, are relatively superficial aspects of the problem of seeing our capitalist society clearly. The basic facts are that:

American capitalism is leading free men to an ever higher material standard of living while respecting their spiritual, social and political freedom.

Communism is leading its people back into a life of servile regimentation under dictatorship.

American capitalism advances to high ground never before attained by free men. Communism retreats to ground that men with an appetite for freedom throughout the ages have sought to escape. If we can establish this truth firmly, around the world, we shall no longer need to worry about communism. It will be hopelessly sunk.

McGraw-Hill Publishing Company, Inc.

BOSCH BREWING COMPANY REPORTS:

No outages...no maintenance...
"We FORGOT WE HAD Transformers"

"The trouble-free service we received from Westinghouse Dry-Type Transformers actually caused us to *forget they had been installed,*" says the General Manager, Bosch Brewing Company, Houghton, Michigan.

"We solved a tough installation problem by fitting them into a crowded wall space where neither a larger transformer or a disconnect switch could have been located," says the contractor, Coon's Electric Shop, Hancock, Michigan.

For five years, two 10-kva Westinghouse Dry-Type Transformers operated with *no outages, no maintenance* . . . decreased a critical heavy load on 3-phase power circuits caused by expanding plant facilities . . . eliminated the need for a separate lighting service.

You can meet the demands of changing electrical loads most economically with Westinghouse Dry-Type Transformers. Easily mounted wherever power is needed, their small size and light weight make them easy to install. Mounted close to load centers, they cost less to operate, reduce power losses. Available with or without built-in breakers. Get a more complete story from your local Westinghouse representative. Or write to Westinghouse Electric Corporation, Transformer Division, Sharon, Pennsylvania. J-70624

YOU CAN BE SURE...IF IT'S
Westinghouse
DRY-TYPE
TRANSFORMERS

On Staten Island wiring repairs...

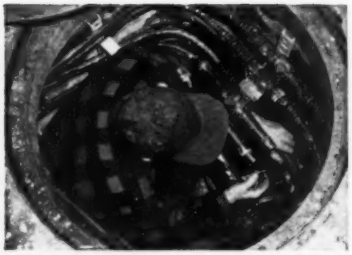
Plastic tape cuts cleanup time, too!

"Scotch" No. 33 Electrical Tape speeds repairs and re-wiring because it strips cleanly from old connections—never leaves gummy adhesive residue. And there's no heavy oxidation on the wiring, either, when "Scotch" No. 33 is on the job—no greening of copper that requires extra cleanup time.

Of course "Scotch" No. 33 Electrical Tape *always* saves time on *new* wiring jobs! It takes the place of two conventional insulating tapes . . . gives more splices in less time—more splices in less space, too.

That's what Staten Island Edison Corporation has found, and they've been using "Scotch" No. 33 Electrical Tape indoors, outdoors—even under ground for the last 3 years!

Try it yourself! Order a supply today!



CABLE SPLICER applies "Scotch" No. 33 Electrical Tape on secondary "hycrabs" in manhole. Plastic backing of tape has high resistance to water, salt water, acids, oils, alkalies, alcohols and other solvents.

"BUG" CONNECTORS on this 3-wire service are insulated with "Scotch" No. 33 Electrical Tape. Super-thin caliper (only .007 inch) combined with high dielectric strength (10,000 volts) makes this tape ideal.

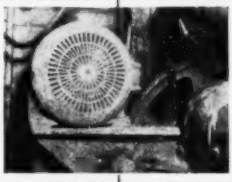
LINEMAN tapes pole end of 3-wire service with "Scotch" No. 33 Electrical Tape prior to connecting to pole. Plastic backing of tape stretches to conform tightly to odd shapes and surfaces.

REG. U.S. PAT. OFF.
SCOTCH
BRAND
Electrical Tape
No. 33

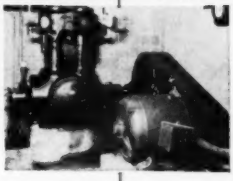
The term "Scotch" and the plaid design are registered trademarks for the more than 200 pressure-sensitive adhesive tapes made in U.S.A. by **Minnesota Mining & Mfg. Co., St. Paul 6, Minn.**—also makers of "Scotch" Sound Recording Tape, "Underseal" Rubberized Coating, "Scotchlite" Reflective Sheeting, "Safety-Walk" Non-slip Surfacing, "3M" Abrasives, "3M" Adhesives. General Export: 270 Park Avenue, New York 17, N. Y. In Canada: London, Ont., Can.

Here are Century splash proof motor's driving fans out in the open, without any protection. You can use the same motors where the plant must be washed down with a hose. Or where there are splashing liquids or falling objects of any kind.

Here is an installation using an explosion proof motor in a tung oil processing plant. You can see how the material clings to the motor and equipment, but it can't affect the vital parts of this Century explosion proof motor.



Here is a motor on a refrigeration compressor in a nice clean room. An open type Century general purpose drip proof motor is therefore used.



CE-732

SELECT THE Century

MOTOR FRAME PROTECTION TO MEET THE CONDITION

Century Motor users in many different classes of industry are paying more and more attention to electric motor protection. Careful motor selection pays big dividends by keeping production TURNING where atmospheric hazards might affect the vital parts of the motor.

You Can Select Century Motors for:

- Normally clean plants.
- Splashing liquids or falling objects. For indoor or outdoor operation.
- For atmospheres containing—oil fog—dust—grit—abrasives—chemicals.
- Explosives.
- Textile lint.

Specify the kind of protection you require on the motorized equipment you purchase. Specify Century motors for the protection that will keep your production turning.

Century C MOTORS

CENTURY ELECTRIC COMPANY

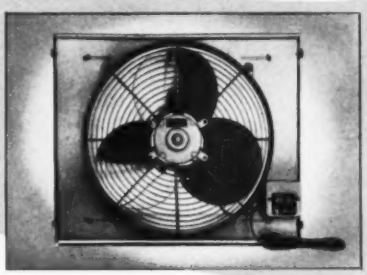
1806 PINE STREET • ST. LOUIS 3, MISSOURI • OFFICES AND STOCK POINTS IN PRINCIPAL CITIES

POWER YOUR PROMOTION WITH SIGNAL and COOLSPOT FANS!

Make your one-stop selection from SIGNAL's complete line of Desk, Pedestal, Window, Exhaust and Vent Fans.

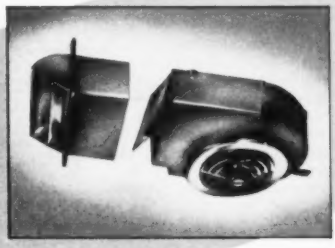
Prompt delivery by leading distributors throughout the country.

MODEL 1251—SIGNAL's heavy duty *16" 3-speed Oscillator Fan* delivers 1500 C.F.M. Induction motor has self-lubricating bronze bearings, is non-radio interfering. Adjustable, fully-enclosed oscillating unit in rear motor housing; 3-speed rotary switch in base. Blue-gray enamel finish. Same fan is available in a Pedestal model (P-1251) adjustable from 4' 6" to 7' 6". Complete line of SIGNAL Desk Fans is available to fit every ventilating need.

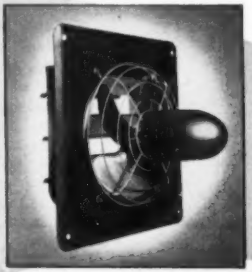


MODEL WR-202—*20" 2-speed Reversible Window Fan* delivers maximum air flow of 5800 C.F.M. at low noise level. 6-pole capacitor motor has distributed winding and is non-radio interfering. Self-aligning, oilless sleeve bearings. Aluminum blade is rubber-mounted, safety-guarded; toggle switch for reversing and two-speed toggle switch for controlling air delivery are mounted on panel. Telescopic side panels adjust to fit standard windows. Beautiful ivory baked-enamel finish. Other models from 16" to 10", reversible and non-reversible.

MODEL 1649—*16" 3-speed* COOLSPOT *Oscillator Fan* combines modest price with traditional SIGNAL features. Air delivery is 1250 C.F.M. through an 80-degree arc of oscillation; 3-speed rotary switch in base. Self-aligning, oilless type bearings in 4-pole, non-radio interfering induction motor. Finished in beautiful opalescent Windsor green. There is a budget-priced COOLSPOT Desk Fan tailored to fit any problem of inside air movement.



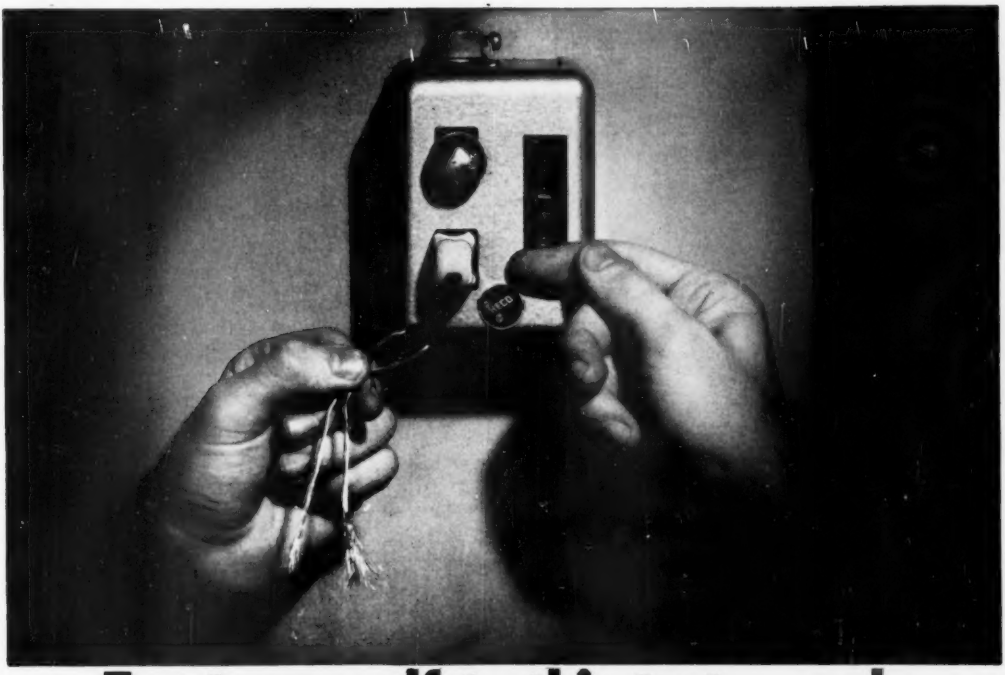
MODEL CW-100—SIGNAL's sensational new *Ceiling or Wall Fan* is handsome, efficient and easily installed. Centrifugal designed blade moves up to 480 C.F.M. quietly, engineered for maintaining high static pressure. 4-pole shaded-coil induction motor is totally enclosed and rubber-mounted, with self-lubricating bronze bearings. Housing is cast aluminum with two shutter vanes—one in cast housing, one in detachable cast aluminum weatherhood which has a 5" removable sleeve. Chrome-plated grille is easily removed without tools; 3-speed chrome flush controller is available for more versatile performance. Be sure to get the facts on our other Kitchen Vent Fan which telescopes to fit any wall thickness from 6" to 11½". Model V30A.



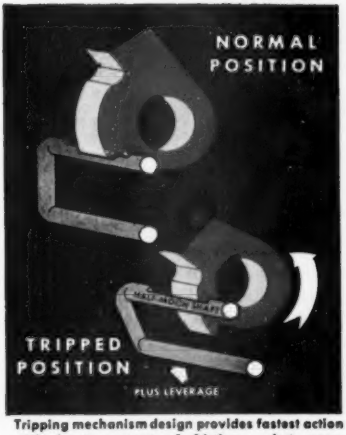
V-700 Series—SIGNAL 16", 12", 10" and 8" *Shutter-Attached Vent Fans* are completely assembled units ready to bolt into place on either window or wall construction. These models move from 500 to 1600 C.F.M. depending on size; shaded 6-pole induction motor on 16" model, shaded 4-pole motors on the others. All motors are totally enclosed and rubber-mounted for longer life and quiet operation. Assembled with gravity-type hooded shutters; aluminum felt-edged vanes are replaceable, prevent rain damage. Durable hammered gray enamel finish on all models. 3-speed controllers available; otherwise the fans operate at one speed.

SEND FOR SIGNAL's NEW COMPLETE CATALOG TODAY!

SIGNAL ELECTRIC MFG. COMPANY, MENOMINEE, MICHIGAN



Trust yourself to this test... only with HEINEMANN CIRCUIT BREAKERS



Tripping mechanism design provides fastest action with least amount of friction... but never nuisance tripping. HEINEMANN Circuit Breakers have no confusing "reset" position... only "On" and "Off." After tripping, this can be turned "On" immediately if the fault has been corrected.

This man is holding a short circuit in his bare fingers. He might receive a bad burn... except that this circuit is protected by HEINEMANN Circuit Breakers.

With slower circuit protection, wires heat, insulation breaks down ... and service troubles get their start. However, HEINEMANN Circuit Breakers don't use heat for actuation... they have no thermal elements. On short circuits, tripping is always instantaneous, in fact, so fast that wires in motor windings and other equipment are completely safe. On momentary overloads a proportioned time delay is provided... being shorter for large overloads... and longer for small ones.

Performance to this extent explains why most equipment manufacturers use HEINEMANN Circuit Breakers in their products.

Send for complete literature. HEINEMANN ELECTRIC COMPANY, 132 Plum Street, Trenton 2, N.J.

don't use heat... USE POWER

HEINEMANN Circuit Breakers.. One, two and three pole.. 10 milliamps to 100 amperes

HEINEMANN Circuit breakers

WHO'S BEHIND YOUR "ANSWER MAN"?

Answer: These Manufacturers

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ELECTRICAL WHOLESALING—March, 1952

We've reprinted the advertising index from the March issue of ELECTRICAL WHOLESALING because it illustrates an important link between your wholesaler's salesman and the manufacturers whose products he recommends and sells to you... a link that works to your advantage.

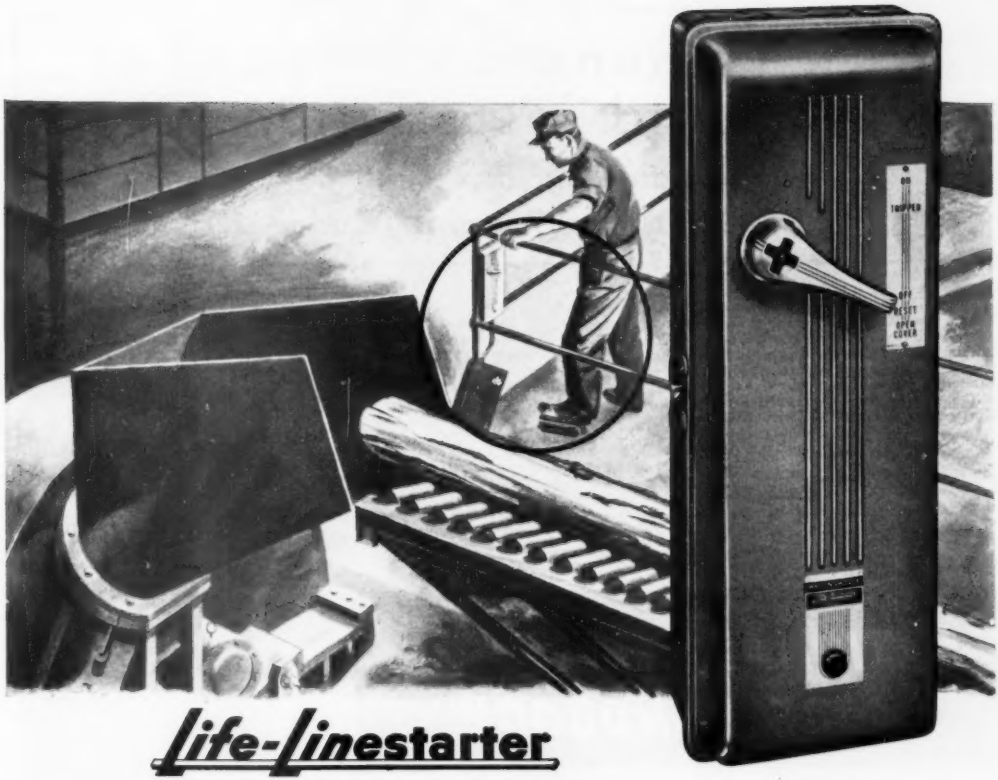
Through consistent, fact-ful advertising in ELECTRICAL WHOLESALING these manufacturers maintain a direct wire with your wholesaler's salesman. They give him the latest word on new products, product changes, new applications and availability. This information means better service for you because it enables your wholesaler's salesman to help you select the proper equipment... and schedule deliveries to coincide with your construction timetable.

Summed up, a well-informed wholesaler's salesman is one of your best and most useful business friends. A reliable "answer man," his efforts are devoted to helping you operate a more efficient and profitable business.

Alert electrical wholesalers and their salesmen read
ELECTRICAL WHOLESALING
The National Magazine of Electrical Wholesale Distribution.

A McGraw-Hill Publication • 330 West 42nd Street, New York 36, N.Y.

ELECTRICAL WHOLESALING



Life-Linestarter

Logs ONE MILLION Starts and Stops

on paper mill's toughest job, without shutdown or breakdown

"Life-Linestarters *are* rugged—my own demonstration proved it to me," says the Chief Electrician of a large southern paper mill.

"I put a Westinghouse Starter to work at the roughest task in the mill—on a chipper conveyor drive motor. To control feed of debarked logs into the chipper spout, the Life-Linestarter, through a foot-operated pushbutton, starts and stops the motor four times a minute, twenty-four hours a day, thirty days a month.

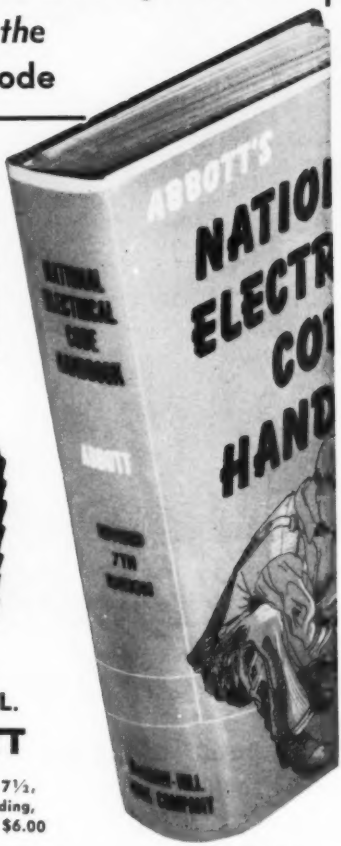
"After continuous operation through at least a million cycles, shutdown to replace contacts showed little wear on the originals—the unit was put back into service immediately. Needless to say, a lot of Life-Linestarters have followed this one into our plant and are now in service in many spots."

Tough assignments? Life-Linestarters love them—give reliable performance in any application. Why not contact your Westinghouse representative for more information? Or write for Booklet B-4677, "Tomorrow's Starter Today", Westinghouse Electric Corporation, Box 868, Pittsburgh 30, Pa. J-30072

YOU CAN BE SURE.. IF IT'S
Westinghouse
Life-Line
MOTORS and CONTROLS

How to handle all types of wiring and installation jobs

in strict accordance with the 1951 National Electrical Code



Here is the electrical contractor's job book completely revised to conform with the 1951 Code requirements and planned to enable electricians to understand and do work in accordance with the National Electrical Code. In Abbott's Handbook, you will find explanations of the rules and measurements for the various types of jobs—what they mean—how to apply them. With it, you can refer to any point about a wiring or installation job by means of the key on the cover and flyleaf—and have the full assurance that no rule which relates to the subject has been overlooked. Wherever a ruling in the Code lacks clarity, it is carefully reviewed and its practical application is explained. More involved Code paragraphs have been divided into short and simple rules; the order of some paragraphs and sections has been changed for easier reference; and many rules have been restated in simple language. Diagrams, sketches, and illustrations are used freely to help you understand the rules quickly and easily.

JUST OUT!

NEW 7th ED.—*ABBOTT'S*

NATIONAL ELECTRICAL CODE HANDBOOK

Here is an unusually practical book, especially planned for quick reference use by busy, practical men. It gives rules and requirements for all jobs in accordance with the latest National Electrical Code. ***All rules for a job are grouped in one place.*** With this Handbook to help you, you cannot miss a single rule and you cannot fail to understand all the rules. It thoroughly covers definitions of the terms used in the Code and general requirements applying to all wiring systems. It includes everything from special requirements pertaining to hazardous locations to complete tables giving the full-load current, wire size, conduit size, and branch fuse rating of various types of motors.

By
ARTHUR L.
ABBOTT

652 pages, 5 x 7½, semi-flexible binding, 441 illustrations, $6.00

A time and money saver

All in all, this Handbook is one of the most unusual and helpful electrical books published. It gives a wealth of information from the practical angle of getting jobs done according to legal requirements, and saving time and money in avoiding false starts, errors, and violations. At the same time, it provides a valuable general reference on many questions of materials, plans, wiring, and installation.

All the tables of data

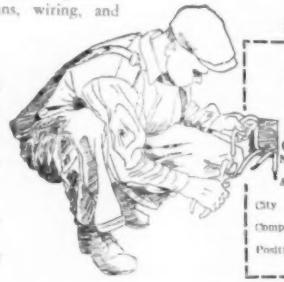
which must be referred to frequently by users of the Code have been placed together in the last chapter in order to make them most convenient for quick reference. Here are tables of simplified data applying to the wiring and protection of motors of all ordinary types, sizes, and voltages; a table for calculating voltage drop; etc.

Key to the Code

A few minutes attention to the Key to the Code on the cover and flyleaf will give the reader a better idea of the scope and contents than could be obtained by two hours' study of the Code itself.

Read this partial list of contents:

- —approved types of wiring
- —installation requirements for all types of wiring
- —cable assemblies
- —requirements applying to all raceways
- —outlet, switch, and junction boxes
- —electrical appliances
- —generators — transformers
- —grounding
- —overcurrent protection
- —outside wiring
- —communication systems
- —elevators — machine tools



SEE THIS BOOK 10 DAYS FREE

McGraw-Hill Book Co., Inc.
330 W. 42nd St., NYC 36, N. Y.

Send me the New 7th Edition of Abbott's NATIONAL ELECTRICAL CODE HANDBOOK for 10 days' examination on approval. In 10 days I will remit $6.00, plus few cents for delivery, or return book postpaid. (We pay for delivery if you remit with coupon; same return privilege.)

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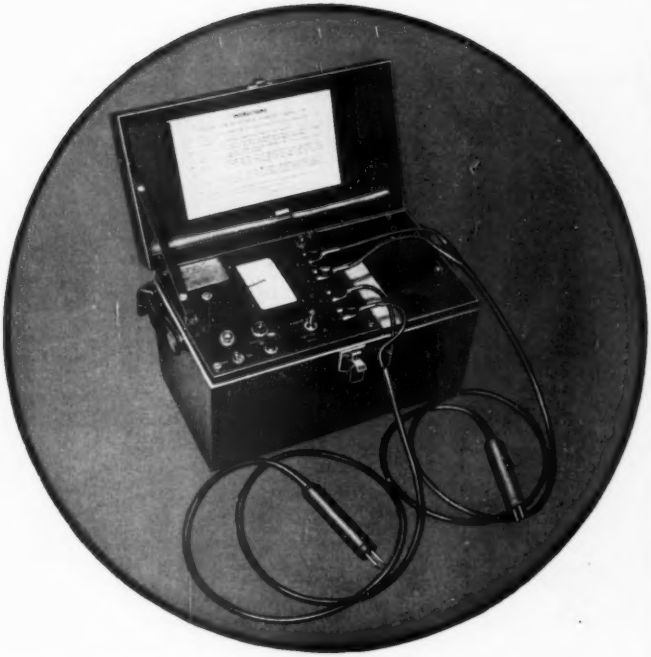


This *NEW INSTRUMENT* Offers Greater Convenience in Field Use

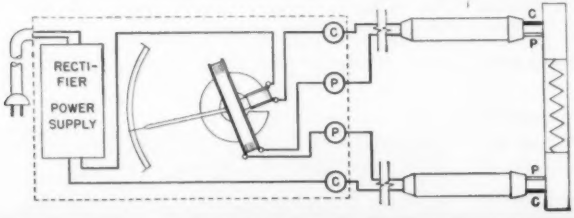
MEGGER® LOW RESISTANCE OHMMETER

This most recent addition to the Megger family of electrical resistance measuring instruments is a general purpose type with self-contained power supply. The set is available in two models, both having the same ranges of 0 to 1000 and 0 to 10,000 microhms. Model 1B carries batteries and Model 1R has a built-in rectifier which plugs into any ordinary lighting circuit outlet. Ample space is provided for the storage of all necessary leads and prods in a compartment of the same case.

The complete unit, with either battery or rectifier weighs only about 19 pounds. It is, therefore, easily portable and convenient to use in the field.

Write for Bulletin 24-46 ECM which describes these new instruments completely.

Schematic diagram of electrical connections for the Megger Low Resistance Ohmmeter



JAMES G. BIDDLE CO.

- ELECTRICAL TESTING INSTRUMENTS
- SPEED MEASURING INSTRUMENTS
- LABORATORY & SCIENTIFIC EQUIPMENT

1316 ARCH STREET
PHILADELPHIA 7, PA.

BIDDLE *Instrument News*

"CABLE-FAULT LOCATING PRACTICES IN PHILADELPHIA"

That is the title of an article which appeared in a recent issue of Electric Light and Power Magazine. It was written by R. S. Diggs, Assistant Superintendent, Service Maintenance Section, Philadelphia Division, Electric Transmission and Distribution Department of the Philadelphia Electric Company.

Mr. Diggs discusses the three methods of locating cable faults used on his company's underground power systems, the a-c method, the thyratron, and the impulse method.

We have obtained a limited supply of these reprints and will be glad to supply them to interested individuals so long as the supply lasts. Check Bulletin 65 P1 ECM on the coupon below.

USERS FIND BIDDLE TTR SETS INDISPENSABLE

There have been a lot of mighty fine things said about our Transformer Turn Ratio Test Set in the two years we have been producing them. But nothing we have heard compares with the comments we have been hearing lately.

Since the announcement of Model 3 we have had requests for modification of several earlier models. It is gratifying to receive comments like:

"We hope that the change-over will not require too much time as this instrument is in daily use on our test floor." and:

"Our instrument is used constantly by the testing department and is such a timesaver that we want to have it back in service as soon as possible."

We would like to quote all the things that have been said about this unique instrument but space does not permit. We urge those who have not investigated the TTR Set to do so by writing for Bulletin 55 ECM which describes it in full.

James G. Biddle Co.
1316 Arch St., Philadelphia 7, Pa.

Gentlemen:
Please send me items checked:

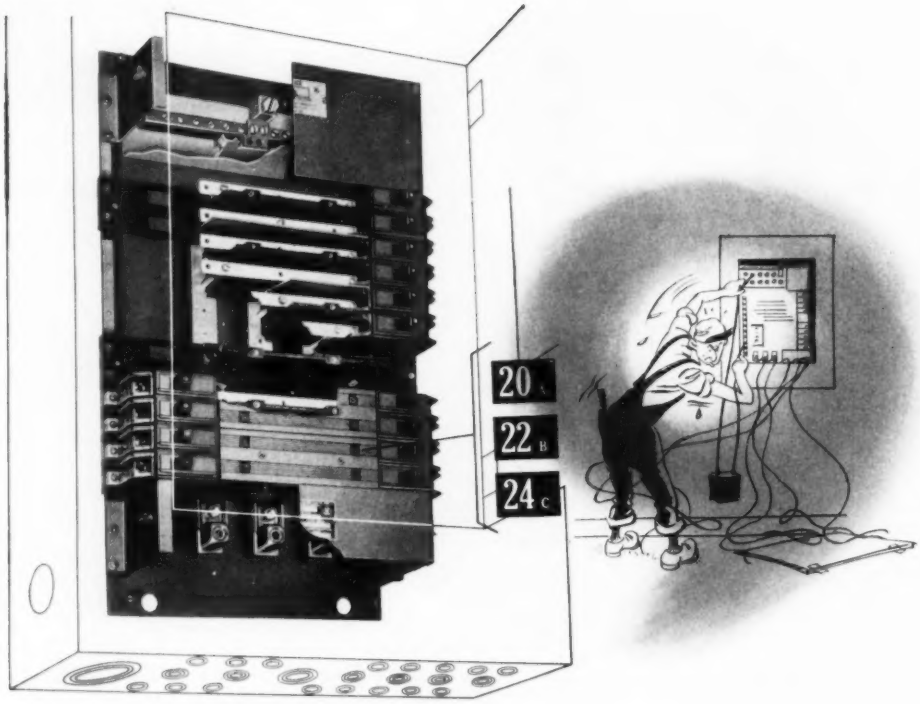
☐ 24-46 ECM ☐ 65 P1 ECM ☐ 55 ECM

NAME

JOB FUNCTION

COMPANY

ADDRESS



Take an *EXTRA LOOK!*

for time-saving, cost-saving installation short cuts

Fast installations cut panelboard costs. Fast conversions for changing or expanding power requirements cut costs. Recently, a prominent trade publication stated that design—type and accessibility of connections, gutter and wiring space and other features—can influence panelboard installation time by as much as 25%.

Here's a typical time-saving, cost-saving extra Westinghouse Panelboards give you:

Permanent Pre-phased Identification—letters on face of panel at each breaker and main bus identify sequence of breaker and bus connections on 3-phase, 4-wire lighting panelboards before and after installation of breakers.

Quick-fasten access plates, trim angle support, reinforced back pan, interchangeable parts are other advantages—extras at no extra cost—provided in Westinghouse Panelboards.

Contact your Westinghouse office or distributor. Or write for Panelboard Planning, B-5260. Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-93474

YOU CAN BE SURE...IF IT'S
Westinghouse
PANELBOARDS

Washington Report

CMP metals controls will be dropped—barring another crisis or a prolonged steel strike. DPA-Boss Fleischmann has okayed it. But decontrol is not easy, and the plans are long range. Tentative timetable is to decontrol aluminum and most steel shapes by early next year. But some control on copper will be held as long as it continues critically scarce.

Controls of some type will still be needed, controls officials say, to insure military priority on all scarce metals and many components. Controls experts are studying various ways out. A simple single band rating like the "DO" is preferred, but its adequacy is being questioned. More on this on page 237.

A new electric power expansion program to add 32-billion kw capacity by end of 1954 has DPA approval. This puts total capacity at 107-million kw, to meet increasing demands for defense and to provide adequate power for civilian use. Class I utilities, for which this program is approved, will get CMP allotments and priorities to implement this program.

Attainment of this expansion program is dependent upon increased production of electric power equipment, with shipments by end of 1953 doubling the 1951 rate, NPA estimates. Bottlenecks will be heavy steam turbines, high-voltage switchgear and transformers, and shortages in square and rectangular copper wire. Industry members say they can meet these increased production demands if necessary materials are made available with advance allotments in material for long lead-time items.

Building construction controls are already eased, and step-by-step decontrol procedures have been announced. First steps, to be taken beginning in 3rd quarter 1952 are: 1) approve pending application for industrial projects and some previously denied; 2) approve commercial projects, especially in non-defense work areas; and 3) increase structural steel allotments for schools, highways and hospitals in 3rd quarter, with possible further increases in 4th quarter. Controlled materials allotments will be made to back up approved projects. Plans are that by year's end most types of construction—except amusement and recreational—will be proceeding at normal rates.

Early last month NPA approved 105 new commercial building projects with an estimated cost of over $53-million in six "hardship" areas: New York-New Jersey, Washington, D. C., Boston, Portland-Seattle, Los Angeles and San Francisco. Materials allotments for these projects are for 3rd quarter use.

Applications for 1,458 industrial expansion projects, with estimated cost of over $7-billion, were recently approved by NPA, and materials alloted for 2nd quarter. These projects are within 23 approved programs. Applications for 1,253 new starts in industrial expansion had to be deferred for action to 3rd quarter however, NPA reported, due to exhaustion of available materials.

Credit is being loosened for local and state building construction projects, through Truman's order to remove restraints on public bond issues for public works established by the FRB Voluntary Credit Restraint Committee.

Housing starts in February totaled 77,000—up 13% from January 1952, and only 3% below February starts last year. The rise occurred in virtually all sections of the country, with significant increases in Middle Atlantic and North Central States, and in the Far West.

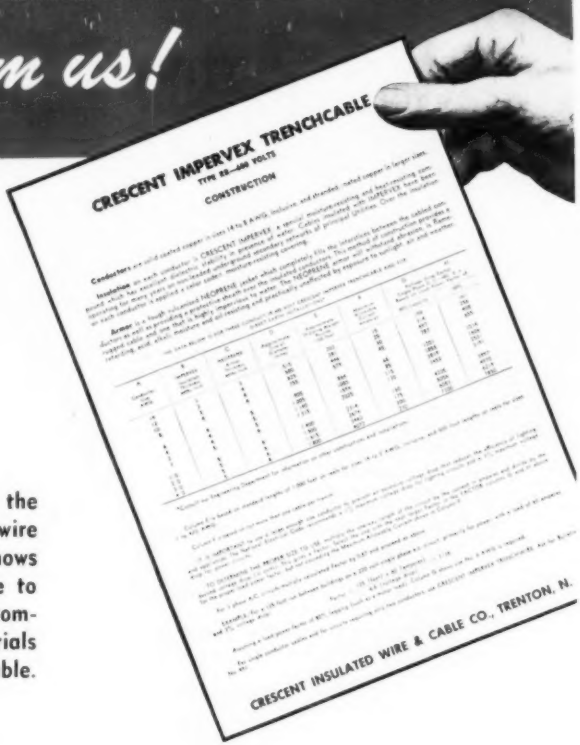
Illuminating glassware for signal lenses and similar purposes should be exempt from NPA restrictions in use of critical selenium, signal lens manufacturers recently told NPA. Use of signal glassware for civilian purposes (railroads, airfields, aircraft) is equally important as that used by the military, they contend. Civilian demand has doubled the pre-Korea rate.

Take it from us!

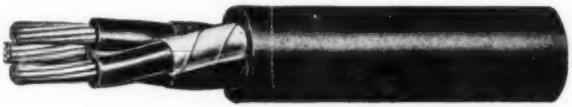
This Bulletin On

CRESCENT IMPERVEX TRENCHCABLE TYPE RR

contains much information of value to the men who buy and install this type of wire and cable. For example, this page shows how to determine the proper size cable to use under various conditions. It gives a complete description of the high quality materials which go into the manufacture of this cable.



SEND FOR BULLETIN 492



CRESCENT IMPERVEX TRENCHCABLE—TYPE RR

The use of this multi-conductor cable in place of multi-conductor lead-covered or parkway cable not only will show substantial savings in the initial cost, but because of its light weight and ease of installation, splicing and terminating will result in installation economies also.

For single conductor cables and for circuits requiring only two conductors, use CRESCENT IMPERVEX TRENCHWIRE. Send for Bulletin No. 491

CRESCENT WIRE & CABLE

CRESCENT INSULATED WIRE & CABLE CO.—TRENTON, N.J.

APRIL.... *at a Glance*

Color Cover

It isn't often that this staid journal indulges in the luxury of four-color process cover pictures. But what with the heavy accent on lighting this month induced by the current Merit Award Competition of the International Lighting Exposition, plus a story about the extraordinary, spectacular and unique color lighting treatment of an office building lobby, (page 141) the temptation was too much for Eastern Editor Cooper and Art Director Phillips. They descended with Photographer Syd Karson on the color job one night and with the cooperation of the system designers and the building management set up and photographed several color patterns. The resulting array of Kodachromes quickly routed the more conservative editorial element.

NISA

Chicago motor shops are welcoming their fellow members of the National Industrial Service Association on the 20th of this month for the Association's annual convention.

To highlight some of the shop facilities in the area, Middle West Editor Eckel made the rounds ahead of the convention to select and photograph typical operations and equipment. His "Behind the Scenes in Chicago Shops" begins on page 49.

High Voltage

Use of primary voltage distribution systems in industrial plants is pretty firmly established. Less common, but no less logical, is its application to commercial buildings. With some relaxation of mobilization restrictions in sight, and a large backlog of commercial construction piled up, a case study of primary voltage distribution applied to a commercial building is well timed. In "Bullock's Shifts to High Voltage," page 54, a major rewiring job is described which uses 4800 volt dual risers with unit substations on each floor.

Instrument Rooms

In a growing number of industrial and commercial operations sensitive electronic apparatus must be operated under better-than-average conditions. Large variations in ambient temperature and humidity must be avoided. Spurious radiation or electrical noise must be shielded out and wiring must provide a minimum of voltage fluctuation. These considerations are particularly important in the nuclear laboratory counting room. John M. Ruddy, Chief Engineer, Architectural Planning and Plant Maintenance Department of Brookhaven National Laboratory, describes in "Counting Room Electrical Design," page 58, how to wire, light, shield and ground rooms used for sensitive electronic instruments.

DATES AHEAD

Illuminating Engineering Society—Southern Regional Conference, Hermitage Hotel, Nashville, Tenn., April 20-22; Canadian Regional Conference, Hotel General Brock, Niagara Falls, Ont., April 30-May 2; Great Lakes Regional Conference, Hotel Statler, Cleveland, Ohio, May 5-6; East Central Regional Conference, Webster Hall Hotel, Pittsburgh, Pa., May 22-23; Northeastern Regional Conference, Hotel Preston, Swampscott, Mass., June 19-20.

Massachusetts Electrical Contractors Convention Authority Tool Exhibit—Under the auspices of the Mass. Electrical Contractors Association and the New England Chapters of NECA, The Bradford Hotel, Boston, Mass., April 16-18.

National Industrial Service Association—Annual convention, Conrad Hilton Hotel, Chicago, Ill., April 20-23.

Industrial Electrical Exposition — Thirteenth annual equipment show sponsored by the Electrical Maintenance Engineers of Milwaukee, Public Service Building Auditorium, Milwaukee, Wis., April 24-25.

Chamber of Commerce — Annual meeting, Washington, D. C., April 28-30.

4th International Lighting Exposition and Conference—Cleveland Municipal Auditorium, Cleveland, Ohio, May 6-9.

Edison Electric Institute—20th Annual Convention, Cleveland, Ohio, June 2-5.

National Association of Electrical Distributors—Annual convention, Atlantic City, N. J., June 9-13.

National Fire Protection Association—Annual meeting, Hotel Statler, New York, N. Y., June 9-13.

New York State Association of Electrical Contractors and Dealers, Inc.—Saranac Inn, Saranac, N. Y., June 29-June 7.

Illuminating Engineering Society—National Technical Conference, Edgewater Beach Hotel, Chicago, Ill., September 8-13.

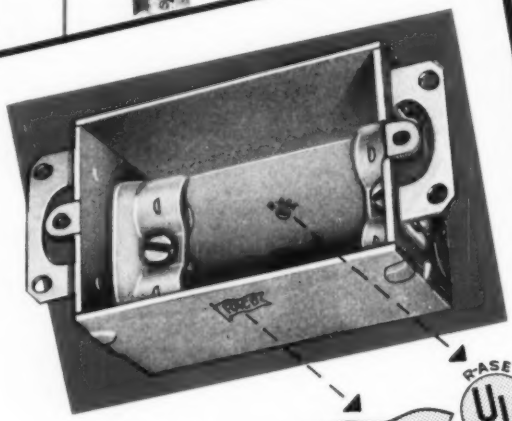
International Association of Electrical Inspectors—Northwestern Section, Twin Falls, Idaho, September 11-13; Southwestern Section, California Hotel, Fresno, Calif., September 18-20; Eastern Section, Hotel Statler, Washington, D. C., October 1-3; Western Section, Hotel Hollenden, Cleveland, Ohio, October 6-8; Southern Section, Hermitage Hotel, Nashville, Tenn., October 13-15.

National Electronics Conference—8th annual conference, Sherman Hotel, Chicago, Ill., September 29-Oct. 1.

Electrical Industries Show—Sponsored by the Eastern Electrical Wholesalers Association, 165th Regiment Armory, New York, N. Y., October 14-17.

National Industrial Service Association—Southeastern Chapter meeting, Miami, Fla., Oct. 24 and 25.

National Electrical Manufacturers Association—Haddon Hall Hotel, Atlantic City, N. J., Nov. 10-13.



What these two signs mean to YOU

The sign of the Underwriters' Laboratories "U-L" stamped on an electrical box means that it has passed the exacting safety examination of that organization and thus will meet the requirements of your local building code. The RACO emblem on a box means that it was designed and is constantly improved to make installation faster, easier, and permanent. This well-known trade-mark on box materials is your assurance that they are adaptable to all wiring needs . . . are handy to use . . . are recognized by architects, engineers, and builders everywhere . . . and are available nation-wide. Look for these two signs . . . insist on them!

You can always rely on RACO

RACO

ALL-STEEL EQUIPMENT Inc.—800 Kensington Ave., Aurora, Illinois

"A BOX FOR EVERY NEED"

ELECTRICAL CONSTRUCTION AND MAINTENANCE

51st Year—APRIL • 1952

Industrial Television

BEHIND THE BRILLIANCE and glamour of television broadcasting a modest little development is growing that deserves close watching by everyone concerned with industrial electrical apparatus. Compact, simplified television equipment can pick up a general view or a detailed close-up of an industrial process and display it continuously and accurately at some remote location.

BEARING ROUGHLY the same relationship to television broadcasting as sound intercommunication does to radio, industrial television uses signals carried over coaxial cables. No large amount of power is required for transmission nor are receivers critically sensitive. The elaborate equipment and circuitry of broadcasting is eliminated. Equipment design is rugged and readily adaptable to industrial surroundings.

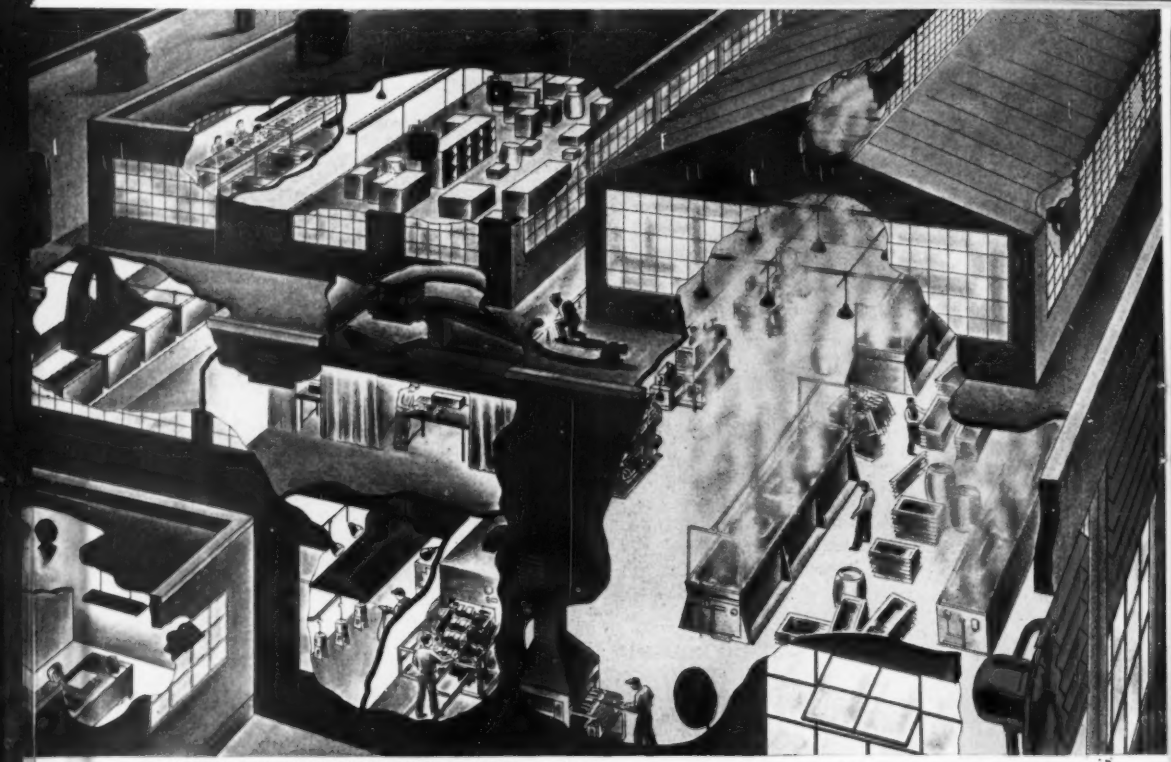
FOR BROADCASTING, a television signal contains several elements which must be combined precisely for transmission and sorted out accurately at the receiver. The carrier envelope contains amplitude modulation for video, two distinct synchronizing pulses, and frequency modulated sound. Industrial television requires no carrier and wiring handles the required signals independently.

APPLICATION OPPORTUNITIES are presently limited by the high cost of the relatively new and specialized apparatus. Experts claim, however, that the instruments can be mass produced and sold within the price range of other business machines of comparable size and complexity.

SUCH SYSTEMS are already doing jobs heretofore impossible, like watching the remote disassembly of hazardous bombs, the observation of highly radioactive materials or a close-up look at equipment under breakdown test. But televiewing has even greater potential in operations where direct observation is simply inconvenient and expensive.

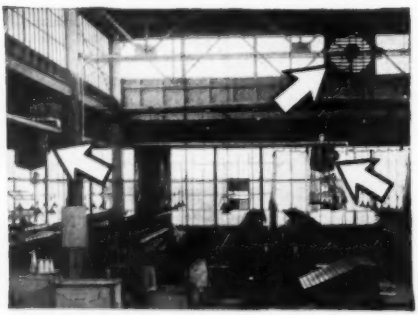
WITH THE PRESENT TREND toward centralized control and remote operation, industrial television is destined to become a familiar and indispensable tool. As equipment becomes more simplified and less costly, the range of uses will widen very rapidly. It is up to industrial electrical contractors and plant electrical departments to be on the alert for practical applications. Televiewing may well become one of the most important electrical developments of the decade.

William T. Stuart



ILG UNITS FOR EVERY VENTILATION NEED. Portable floor fans for spot cooling . . . circulators and window ventilators for offices . . . self-cooled propeller fans and universal blowers for large-volume circulation – there's a standard ILG unit designed to provide efficient flow of cool, refreshing air wherever it's needed. And, you'll find them *all* conveniently available through your nearby Graybar office.

Put fresh air to work for your customers



Unit heaters, infra-red drying units, and accessories, too, are distributed by Graybar. Combined with an efficient ventilating system, you can provide for even heat distribution during cold weather. Your Graybar representative will be glad to furnish accurate information to help you prepare bids and work out practical job time tables.

You can make your customers' plant a healthier, more comfortable place to work through adequate ventilation. Removing fumes, heat, dust, and stuffy air with efficient ILG ventilating units, cuts worker fatigue . . . reduces costly accidents and material spoilage . . . speeds production all around.

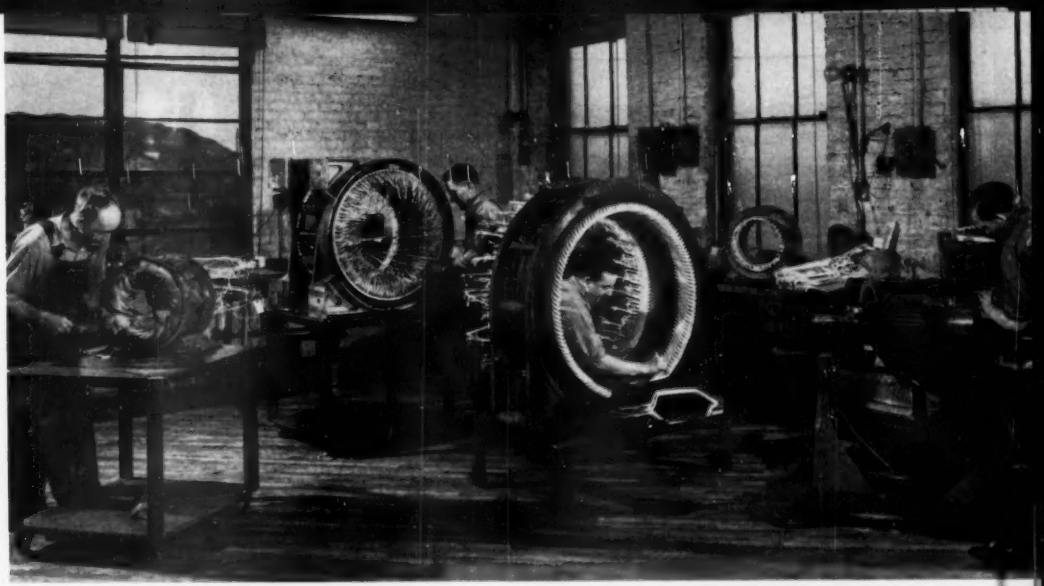
Graybar-distributed ILG fans and blowers are the best-designed and best-built units you can provide. Call your nearest Graybar office for free survey help on any ventilation job—we'll be glad to work with you and your customer in the selection of the ILG equipment best suited for individual requirements.

Remember, Graybar is an all-inclusive source for everything electrical. We distribute over 100,000 electrical items for wiring, lighting, communication, power as well as ventilation. *Graybar Electric Co., Inc. Executive Offices: Graybar Building, New York 17, N. Y.* 235-44

Call Graybar first for...

Graybar Everything Electrical

IN OVER 100 PRINCIPAL CITIES



STATOR STANDS of various dimensions and height facilitate placing coils in slots at Chicago Electric Co. repair shop.

Behind the Scenes in Chicago Shops

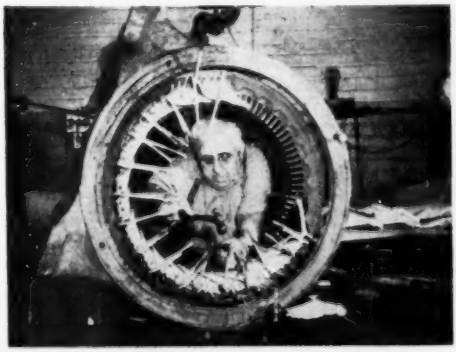
Local motor repair shops open their doors to visiting NISA convention delegates; show facilities developed to serve Chicago's huge industrial plant.

HUNDREDS of motor shop operators from all parts of the country will converge on Chicago this month to attend the 19th Annual Convention of the National Industrial Service Association. They will sit in on a working conference planned around a forum type program where each man can hear and be heard on a number of pertinent subjects. They will swap experiences and talk shop, view product exhibits. Before the conference is over they will have what they came for—a host of new ideas and techniques which can be incorporated into their individual business operations.

This has happened at each convention in the past. It will happen again this year. Succeeding years will produce the same result. It is this type of cooperative spirit that has resulted in a stronger, more resourceful motor repair industry.

While in the Windy City, NISA delegates will be in

CARBON BRUSH fabrication is part of the service offered by the Hohman & Hill shop. Brushes are cut, beveled and ground to specified size.



REWINDING STATOR of a 100 hp. motor to 150 hp. rating at Sievert Electric Co. after waiting an extended time for materials to make glass insulated coils.

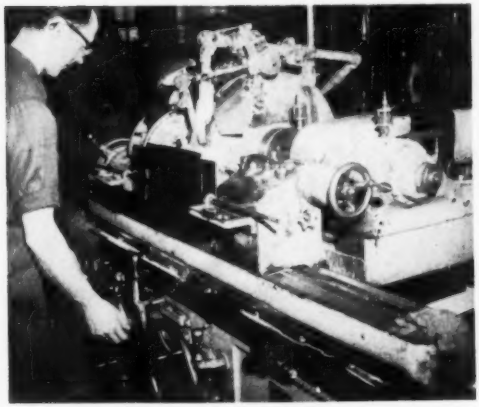
LARGE BRIDGE CRANE handles heavy units in the large equipment repair section of the Chicago Electric Co. shop.

Behind the Scenes (continued)

the heart of a multi-million dollar electric equipment repair market served by a cooperative group of progressive motor service shops. Visiting motor shop operators will want to round out their trip by looking in on a few local shops. Where else would you find a shop man spending his leisure hours during a technical conference?

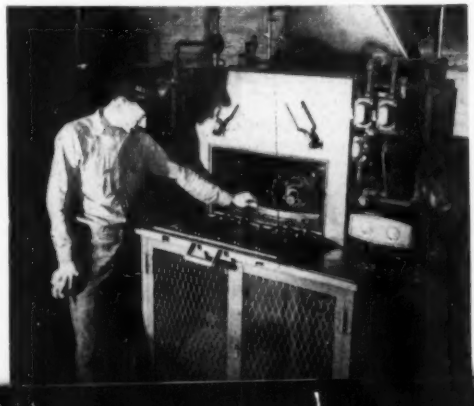
To make it easier for the visitor to do this, members of the Central District Chapter (convention hosts) will provide conducted tours through representative local shops. This picture preview presents a necessarily small part of the facilities to be seen—ideas these shops have developed to serve Chicago's huge industrial plant. Much more awaits the visitor in the way of improved techniques running the whole gamut of motor repair operation. Dozens of practical ideas have been developed in Chicago shops to increase operating efficiency and to expand customer service. They are there for the visitor to investigate. They might be the key to the solution of one of his problems. Chicago motor shop operators hope so.

LARGE STOCK OF reconditioned motors is maintained by Chicago Electric Co., for customer use on loan or

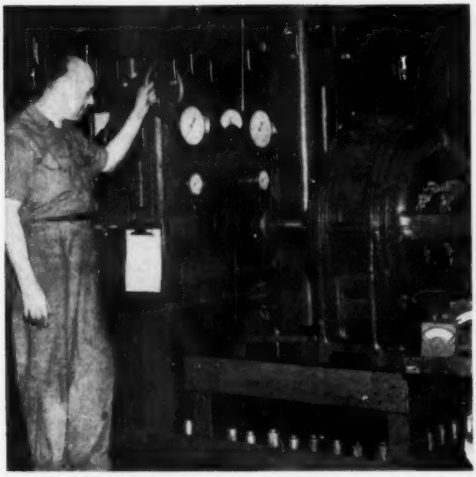


GRINDING MACHINE puts precision finish on rotor shaft at Northwestern Electric Company. Unit is used for both repair and manufacturing departments.

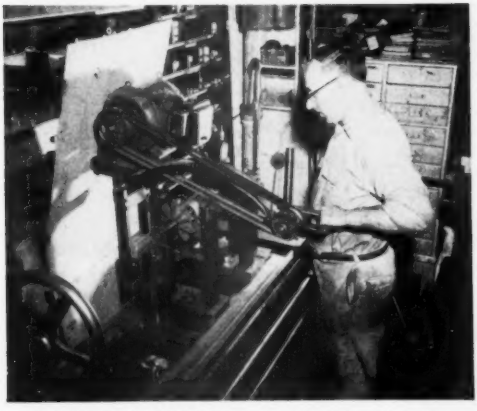
AUTOMATIC SPRAY UNIT speeds motor parts cleaning at Hyre Electric Co. shop. Detergent spray washes parts on rotating turntable when cabinet door is closed.



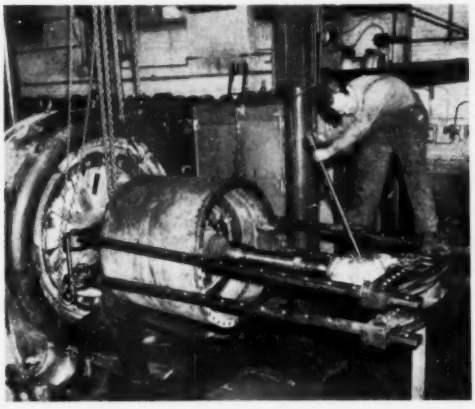
rental basis during emergencies. Units range up to 300 hp in size.



FLEXIBLE DYNAMIC balancing unit built by Excel Electric Service Co. mounts on 24-inch lathe bed; is fully adjustable.

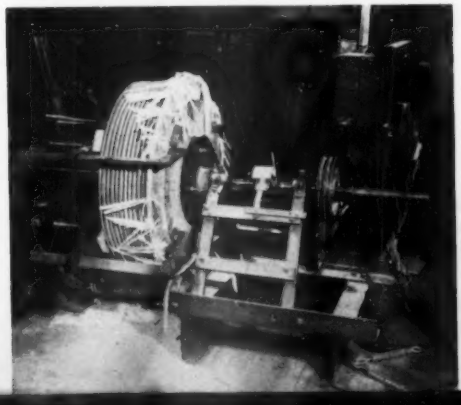


FLEXIBLE DYNAMOMETER unit designed and built at Arthur Wagner Co. shop tests motors from 7½ to 125 hp. in size, ac or dc slow or high speed.

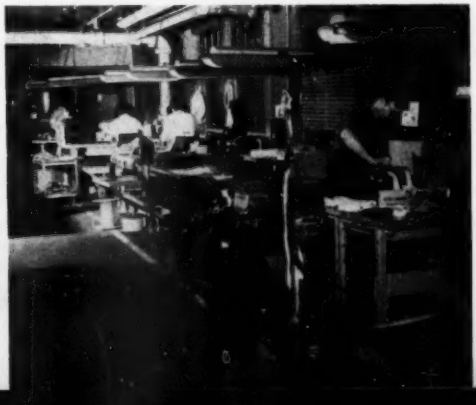


NO PULLEY IS too large to be easily removed from a shaft with this 100-ton hydraulic puller in the repair department of the Arthur Wagner Company.

SPECIAL WINDING head with separate control panel was built by Hyre Electric Co., to wind director magnets for a university cyclotron installation.

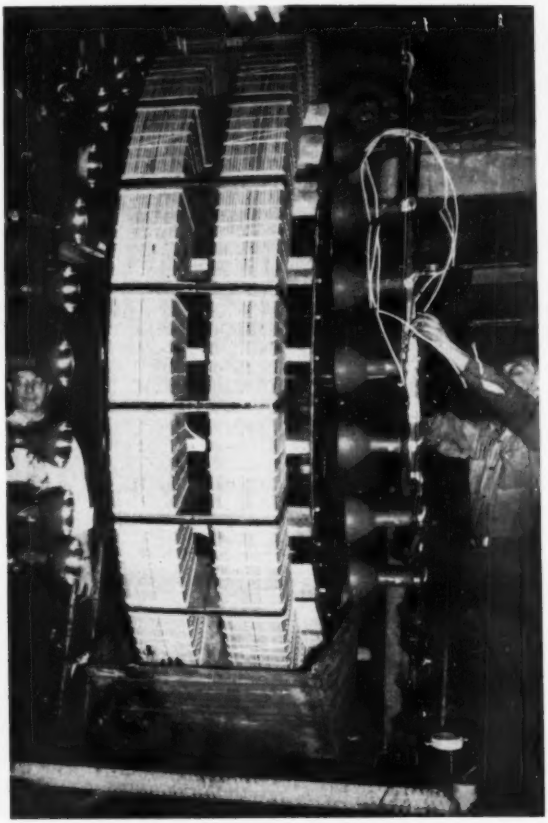


CAREFULLY PLANNED coil and stator winding departments, like this at Northwestern Electric Co., add to efficiency of shop operation.



ADEQUATE MACHINE SHOP facilities permit repair shops to make needed parts when deliveries are long. These at Northwestern Electric Co. are used for repair and special motor manufacturing purposes.

SEMI-CIRCULAR MONORAIL with electric hoist on radial beam cuts back-breaking equipment handling labor at Sievert Electric Co.



HUGE COIL for a university cyclotron was fabricated in the Hyre Electric Co. shop. Here, unit gets continuous varnish dip (at base) and heat-lamp drying while being slowly rotated.

FASTER WINDING of field coils is accomplished at Sievert Electric Company, by using counter-weight device for balancing copper.

ELECTRIC IMPACT wrench at Sievert Electric Co. speeds disassembly and assembly of motors; is used for all types of nut running and tapping operations.

Adjustment of Conduit Labor Units for Parallel Runs

By Ray Ashley
Research and Consulting Engineer
Chicago, Illinois

QUESTION: *How are standard labor units for single runs of conduit adjusted to compensate for parallel runs?*

ANSWER: *Eighty percent of the base unit is used for each additional conduit.*

DISCUSSION: The accompanying study shows a listing of the required operations for installing conduit. The two columns of figures provide a comparison between the time required for a single run of 1½-inch conduit and a second run of same in parallel. *The time for installing fastenings and hangers is not included.*

To illustrate the 80 percent rule let's consider a triple run of 3-inch conduit. With a standard labor unit of 28 hours per 100-ft. of 3-in. conduit, the labor per 100 ft. of three conduits in parallel would be figured as follows:

1st run—100% of 28 hours=28 hrs.
2nd run— 80% of 28 hours=22.4 hrs.
3rd run— 80% of 28 hours=22.4 hrs.

Total ..... 72.8 hrs.
Average per 100 ft. of conduit (72.8 ÷ 3) = 24.27 hrs.

Multipliers for establishing a single unit to be applied to all conduits, in a parallel group, are figured as follows:

2 conduits—(1.00+.80)÷2=0.90
3 conduits—[1.00+(2×.80)]÷3=0.87
4 conduits—[1.00+(3×.80)]÷4=0.85
5 conduits—[1.00+(4×.80)]÷5=0.84

For parallel conduits in excess of five runs the 0.84 multiplier is used.

Different Size Conduits

The conduits may not all be of the same size. In that event the standard unit must be used for the first run of the largest conduit in the group. The 80 percent multiplier can be applied to the units for other runs. Note that in the comparison study the second run has an allowance of 0.10 hours for setting up and handling tools. This allowance takes care of the extra labor caused by odd sizes of tools required.

As an example: Consider an installation having two 3-in., two 2-in., and one 1½-in. conduits run in parallel. The following will be used as standard units for single runs.

3-in. conduit—28 hours per 100 ft.
2-in. conduit—16 hours per 100 ft.
1½-in. conduit—11 hours per 100 ft.

The units applicable to the work we are figuring would be:

3-in. conduit—First run—
100% of 28 hours 28 hrs.
3-in. conduit—Second run—
80% of 28 hours 22.4 hrs.
2-in. conduit—
80% of 16 hours 12.8 hrs.
1½-in. conduit—
80% of 11 hours 8.8 hrs.

The time (not including fastenings and hangers) per 100 Ft. of installation would be:

100 Ft. of 3-in. at 28 hours/C
28 Hrs.
100 Ft. of 3-in. at 22.4 hours/C
22.4 Hrs.
200 Ft. of 2-in. at 12.8 hours/C
25.6 Hrs.
100 Ft. of 1½-in. at 8.8 hours/C
8.8 Hrs.

Total.....84.8 Hrs.

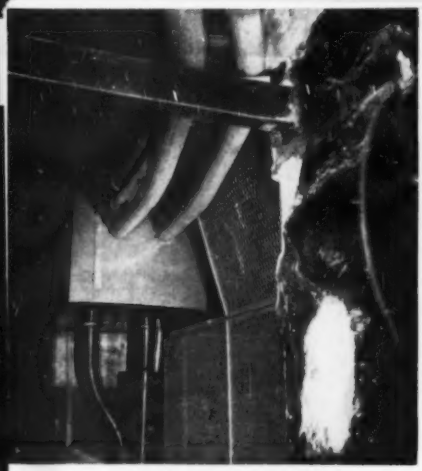
Fastenings and Hangers

Fastenings and hangers must be figured separately when estimating parallel runs. It is also generally considered good practice to figure hangers separately for single runs. Some estimators contend that if the hanger labor is not included with the conduit, it is likely to be left out. That is one of the hazards of estimating. The material for fastenings has to be listed separately and the labor for same can be carried along with it.

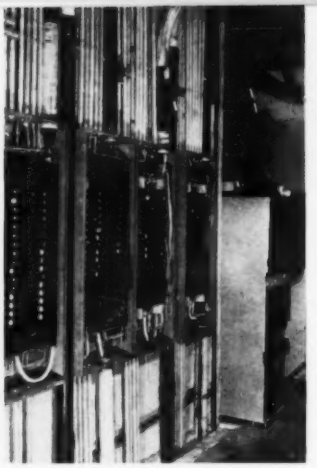
Our next question will deal with the distribution of labor charges.

COMPARISON OF INSTALLATION TIME—1½-IN. CONDUIT SINGLE VS PARALLEL RUN

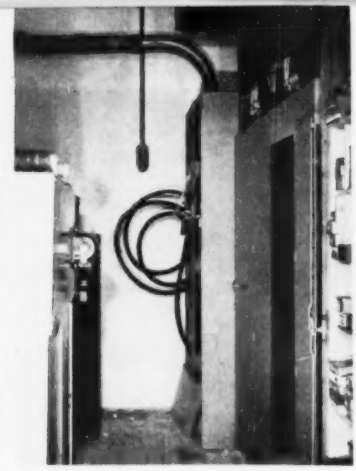
Operation	HOURS PER 100 FT. Single Conduit	Parallel Run
1. Study Time, Ordering, & Checking	.40	.15
2. Unload and Deliver to Storage Space	.40	.35
3. Moving from Storage to Point of Installation	.40	.35
4. Laying Out Runs and Measuring for Nipples	.90	.50
5. Setting Up and Handling Tools	.30	.10
6. Cutting Conduit—Incl. Measuring 3 cuts per 100 Ft.	.80	.70
7. Threading—Incl. Necessary Cleaning 5 Threads per 100 Ft.	2.40	2.20
8. Installing Conduit (not including ells & offsets)	2.50	2.00
9. Installing Elbows and Couplings 2 per 100 Ft.	.80	.70
10. Offsets—Making and Installing	1.75	1.40
11. Connections at Pull Box or Cabinets 2 per 100 Ft.	.35	.30
TOTAL	11.00	8.75



PRIMARY FEEDER CONDUITS come in from utility vault and drop down through large pull box to switch room in building across a court.



ONE SIDE OF unit substation room on each floor has lighting distribution panels and transformer (right) with primary disconnect switch, while . . .



OTHER SIDE OF same room contains the secondary main and tie breakers (right, rear) and the cubicles housing the secondary feeder breakers.

Bullock's Shifts to High Voltage

Dual primary risers plus split secondary distribution cut rewiring costs and assure service continuity at Bullock's Los Angeles store.

A LONG-TERM, large-scale rewiring project is in progress at the Bullock's, Inc., store in Los Angeles. It includes practically a complete rehabilitation of the store electrical system from service entrance to utilization outlet. Started several years ago as part of a general store-wide modernization program, it is being completed bit by bit as conditions permit. When it is finished, Bullock's will have a modern, flexible distribution system designed to provide an average load of 12 watts per square foot of sales floor area. As a result, customers will be able to shop in pleasant light-conditioned and air-conditioned surroundings with merchandise highlighted to best advantage.

As Bullock's grew, it expanded into adjoining buildings. The store today encompasses seven buildings occupying about a half city block. With store expansion came electrical distribution problems and final integration of the system. Recent emphasis on high intensity lighting as a sales tool raised the problem of additional capacity. Complete rewiring was the answer.

Basic load calculations call for 75% of the total store area (sales floors) to have 12 watts per square foot with maintained lighting intensities up to 100 footcandles; 25% of the area (fitting rooms, stock rooms, etc.) to have nine watts per square foot with intensities of 45 to 50 footcandles. This compared to existing average loads of about three watts per square foot and intensities of from three to nine footcandles.

To provide this added load in the most economical method, the E-L-E Company, consulting engineers on the project, chose primary distribution to supplant the old secondary 110/220-volt, 3-wire feeders. Secondary circuits on each floor are of the 3-phase, 4-wire type. The R. R. Jones Electric Co., South Pasadena, Calif., made the complete installation.

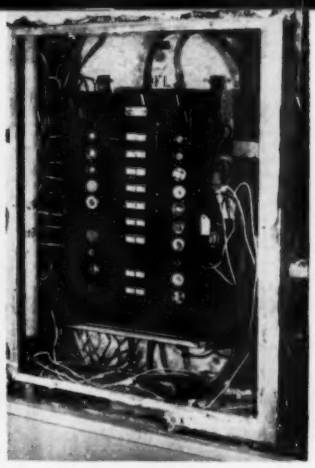
Use Floor Unit-Subs

The lifeline of the new distribution is the primary system which begins in the sub-basement switchroom some 33 feet below street level. Here, two 4,800-volt, 3-phase circuits come in from the L. A. Department of Water & Power vault, go through the utility breaker and metering equipment to Bullock's primary switchgear (two 1,200-amp, 4,800-volt air circuit breakers). While six 4-inch conduits enter the switchroom from the vault, three are capped. Two are used and one is kept free as a spare. Space is provided for the addition of two breaker cubicles when the rest of the store is changed over.

Two 4-inch conduits, each with three 4/0, single-conductor, 15 kv Neoprene Coronol shielded cables, constitute the primary risers for the Broadway building (about half of the total store area). One circuit feeds four alternate floors; the other serves the remaining five floors.

Each floor has its own unit substation room located away from the sales area and adjacent to an old dumbwaiter shaft now used as an air supply shaft. Unit substations consist of a primary disconnect switch (400-amp, 7.5 kv, 3-pole, 2-position with dry type fuse

TWIN PANELS IN sales area are built in an enclosure to match store fixtures. Unit at left is fed from floor substation; panel at right from another floor.



PLENTY OF GUTTER space is available in this panel serving the electrical system for escalators only. Unit is built into stairway wall, concealed by door.

GROUNDING OF DISTRIBUTION system was carefully planned. Here, three ground cables and protective conduits are securely bonded to water main.

By H. W. Snyder

Electrical Supt.
Bullock's, Inc.,
Los Angeles, Calif.

and H. B. Stockton

Superintendent
R. R. Jones Electric Co.
South Pasadena, Calif.

with condenser) which is key-interlocked with the main secondary breaker; a 300-kv, 3-phase, 4,800-volt-208/120-volt, dry type transformer; and secondary distribution board. Because of space limitations, the secondary distribution facilities are generally located opposite the primary switch and transformer. Connection, where feasible, is by means of 1,000-ampere bus duct.

One interesting point was the basis on which transformers were chosen. A major factor considered by Bullock's was the decibel rating of the unit (noise level). While not too disturbing in industrial and commercial building applications, where transformers are located in special remote rooms, transformer hum can be quite objectionable in stores — particularly where there is a unit on each floor. Transformers with the least hum now serve the Bullock store.

Split Secondary Distribution

Two design features of the secondary distribution system assure continuity of service. The low-voltage

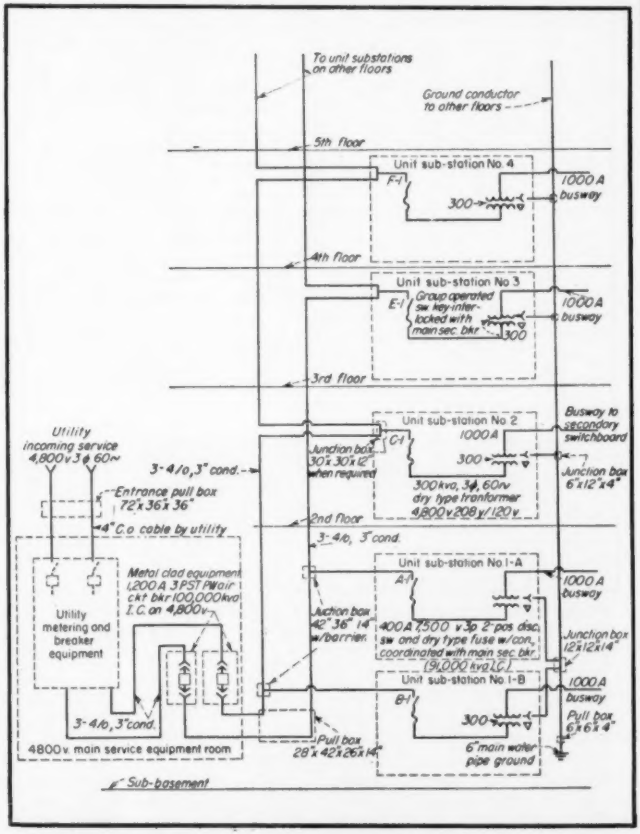

To unit substations on other floors
Ground conductor to other floors
5th floor
Unit sub-station No. 4
F-1
300
1000 A busway
4th floor
Unit sub-station No 3
E-1
Group operated sw key-interlocked with main sec. bkr
300
1000 A busway
3rd floor
Unit sub-station No 2
C-1
1000 A
300
Busway to secondary switchboard
Junction box 6"x12"x4"
Utility incoming service 4,800 v 3 ϕ 60 ~
3-4/0, 3" cond.
Junction box 30"x30"x12" when required
300 kva, 3ϕ, 60 ~ dry type tranformer 4,800 v 208 y/120 v.
Entrance pull box 72"x36"x36"
4" C.o cable by utility
2nd floor
3-4/0, 3" cond.
Unit sub-station No 1-A
A-1
1000 A busway
Metal clad equipment 1200 A 3 PST Mair ckt bkr 100,000 kva I.C. on 4,800 v
Utility metering and breaker equipment
Junction box 42"x36"x14" w/barrier
400 A 7500 v 3p 2 pos disc. sw and dry type fuse w/con. coordinated with main sec. bkr (91,000 kva I.C.)
Junction box 12"x12"x4"
Unit sub-station No 1-B
B-1
300
1000 A busway
Pull box 6"x6"x4"
3-4/0, 3" cond.
4800 v main service equipment room
Pull box 28"x42"x26"
6" main water pipe ground
Sub-basement

FIG. 1 Dual primary risers bring 4,800-volts to 300-kva. unit substations on each floor. Each feeder serves alternate floors. Primary, fused disconnect at each transformer is key-interlocked with main secondary breaker of unit substation.

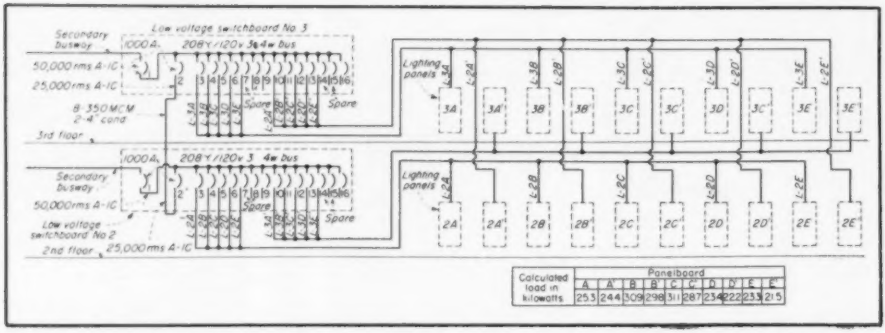


FIG. 2 Split secondary distribution system assures service continuity. Half the lighting panels on each floor are fed from unit sub on that floor; others from next floor. Switchboards are interconnected by tie breakers and feeder.

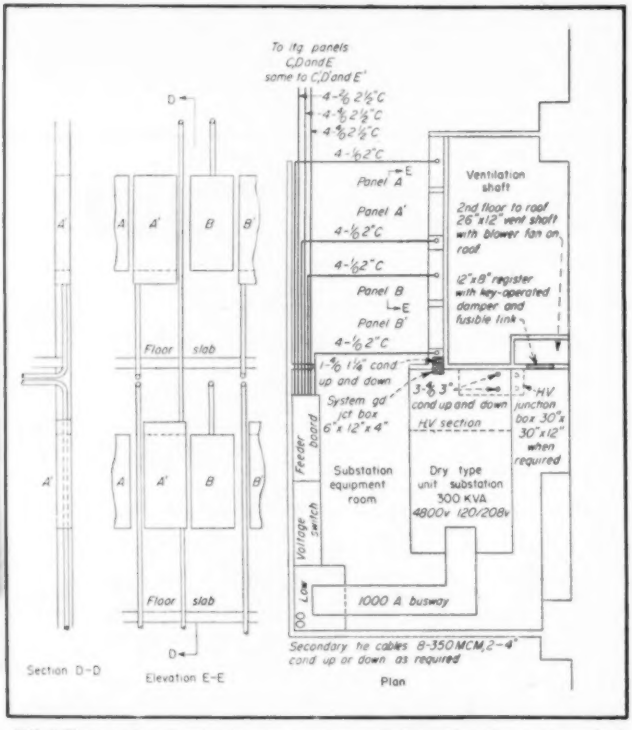

To ltg. panels C, D and E same to C, D and E'
4-1/0 2½"C
4-1/0 2½"C
4-1/0 2½"C
4-1/0 2"C
Panel A
Panel A'
4-1/0 2"C
4-1/0 2"C
Panel B
Panel B'
4-1/0 2"C
Ventilation shaft
2nd floor to roof 26"x12" vent shaft with blower fan on roof
12"x8" register with key-operated damper and fusible link
1-4/0 1¼" cond up and down
3-4/0 3" cond up and down
HV section
HV junction box 30"x 30"x12" when required
System gd ict box 6"x 12"x 4"
Substation equipment room
Dry type unit substation 300 KVA 4800v 120/208v
Feeder board
Voltage switch
Low
1000 A busway
Floor slab
Secondary he cables 8-350 MCM, 2-4" cond up or down as required
Section D-D
Elevation E-E
Plan

FIG. 3 Typical plan of unit substation room on each floor. Note that only standard (A, B, etc.) panels are fed from this floor above or below. Prime panels (A', B', etc.) are fed from floor above or below.

switchboards on adjacent floors (served by the dual primary feeders) are interconnected by a tie feeder (8-350MCM cables in two 4-inch conduits) with 1,000-ampere breakers interlocked with the main breaker in each unit substation. Thus, should a transformer fail on either of the interconnected floors, the other transformer could carry 65% of the total loads of both floors indefinitely, or 100% of the total dual load for about a 10-hour period (normal store operating today).

Transformers of capacity greater than calculated floor loads were installed purposely to provide this factor of safety. Also, each secondary switchboard has three or four spare distribution breakers to take care of possible future load increases on each floor. In case a transformer should burn out, Bullock's keeps a spare 300-kva unit for quick replacement.

Even though a primary feeder or unit substation should fail, no floor would be without power even momentarily—an important factor in preventing customer panic in an emergency. Feeders from each of the interconnected unit substations serve both floors.

This split-secondary distribution scheme does nothing more complicated than divide the load on each substation equally between the two floors served by the interconected transformers. Normally, each floor has ten lighting distribution panels, each being served by a separate circuit and breaker on the main board. Five of these panels (called standard) are fed by the unit substation located on that floor. The other five (called prime panels) are fed from the interconnected substation on the floor above or below, as the case may be. For example: Panels 2A, 2B, 2C, etc., are served by unit substation No. 2 on the second floor. Panels 2A', 2B', 2C', etc., are served by interconnected unit substation No. 3 on the third floor. In like manner third floor standard (3A, 3B, etc.) panels are fed from unit sub No. 3 while the prime (3A', 3B', etc.) panels have feeders originating at unit substations No. 2 on the second floor.

Under this secondary distribution system, half the lighting panels on each floor will be in operation even during an outage. The one exception is the highly improbable condition where both primary feeders or both interconnected transformers fail.

1946 VIEW OF WOMEN'S SHOE department looked like this with low intensity incandescent lighting; was in line for complete remodeling.

1951 VIEW OF SAME department after modernization was completed. Acoustic tile ceiling houses large fluorescent panels, incandescent dome units and adjustable spots.

To provide the necessary circuit capacity for the increased lighting levels and to add flexibility to the system, all branch circuits were revamped using thin-wall conduit (¾-in. minimum where concealed) and No. 12 conductors as a minimum. Each wire is clearly identified, where it enters the panel, by a "numbered" band which corresponds to the panel terminal number.

In a department store, it is frequently necessary to use special high intensity lighting to highlight certain merchandise displays for a limited time. Usually, this means heavier fuse protection on those specific circuits (wire sizes permit this added short time load).

Bullock's electrical department maintains rigid control over branch circuit protection by using color coded fuses in the panels. Identification is as follows:

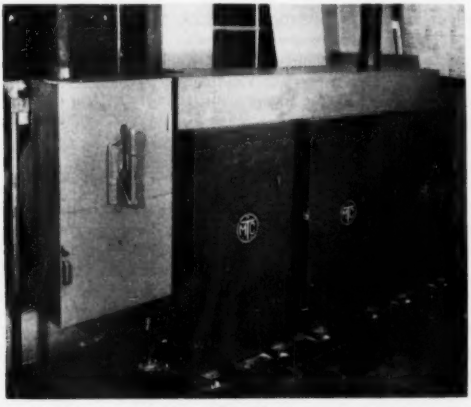
Standard color—15 ampere fuse
Green color—20 to 25 ampere fuse
Red color—30 ampere fuse

A mere glance at the lighting panel interior will show how many circuits are being used for special lighting and what protection they have. As an additional safety factor, a maintenance electrician inspects all lighting panels once a month and replaces all colored fuses with the standard 15-ampere units.

Most of the work on this project was done during regular store hours and electrical service had to be maintained at all times. To serve each floor during the shift to primary distribution, a bank of three, 50-kva, single-phase, air-cooled transformers were installed in the basement. They were connected to a three-phase circuit previously abandoned when 4,800-volt circuits were installed for the air conditioning equipment. This "temporary" setup is being retained for similar use when the other half of the store is changed over to primary service.

The primary feeders already installed have produced considerable copper economy. By placing load concentrations on each floor, heavy, costly secondary circuit lengths have been held to a practicable minimum. The forethought shown in designing adequate spare capacity in the system gives sufficient leeway to follow the trend to higher lighting intensities and expanded use of electrical energy in commercial buildings of this type.

OLD TYPE LIGHTING panel has 120/240-volt, 3-wire feeders; two-wire branches. Its 54 circuits were split up into six sections, each with individual feeder.



TEMPORARY TRANSFORMER BANK was installed in basement to serve individual floors during changeover; is being retained for use when rest of store shifts to primary feeders.

Counting Room Electrical Design

INSTRUMENT ROOM in a nuclear laboratory requires special wiring design considerations for grounding, shielding and isolation.

How to wire, light, shield and ground counting rooms in a nuclear laboratory. The data presented is also applicable to industrial areas where sensitive electronic equipment must operate with high precision.

By John M. Ruddy *Chief Engineer Architectural Planning and Plant Maintenance Department, Brookhaven National Laboratory*

THE counting room in the nuclear laboratory is the area within which the nuclear disintegration rates and energy levels of radioactive substances are determined (by means of Geiger-Mueller, scintillation and other type counters and scalers and pulse height analyses, completely or partly automatic in operation). The principal items of interest and concern to the electrical design engineer in the design of a counting room, comprise lighting and power, voltage regulation, nuclear and electromagnetic radiation shielding, grounding, and the air conditioning requirements for the counting equipment.

Lighting and Power

Since a counting room contains many delicate measuring devices with complex scales and adjustments requiring precise reading, a good level of lighting is necessary. Fifty footcandles or more, on the old comparative intensity scale would be acceptable; with attention, however, to see-ability for close visual tasks—equivalent footlamberts is a more effective measure.

Unless incandescent type lighting poses too serious a heat load in the design of the air conditioning system, it is preferable in view of the possible interference from fluorescent lighting. While there is as yet no complete agreement regarding the effect of fluorescent lighting on the complicated electronic equipment used, there is now enough experience (and data in the literature) to make incandescent lighting a first choice when all other aspects are found equal. If fluorescent lighting must be used, extreme care should be taken to insure that the best ballasts, tubes and starters are used in the counting area and the immediate vicinity. Experimental work has revealed, for instance, that a poor starter can invalidate a whole counting run before the cause is discovered and there is small probability that this type of trouble will be promptly recognized.

The electric power and lighting circuits should be passed through an isolation transformer and filter, set just outside the counting area for the best results. Where this installation does not seem economically justified, at the time of the original installation, it should still be provided for by having both circuits separate and passing through special junction boxes just outside the room, where the filters and the isolation transformers may be connected.

When there is an extra large number of outlets mostly for convenience the diversity factor may be average, but a counting room can and often does have a diversity factor of one, so panels, fusing, and circuiting should be based on 100% usage. The amount of power supplied to a counting room should usually be about 300 watts per running foot of bench.

Voltage Regulation

The minimum provision for voltage regulation on the power circuit to the receptacles should be complete segregation from other power circuits and a junction box where these circuits enter the space so that a sensitive voltage regulator can be installed if required. Even though most of the modern electronic power supplies have built-in voltage regulation, provisions for additional regulation is usually needed because, while utility voltage regulation to a building is within the usual plus or minus 10%, the additional unusual loads of the user, in

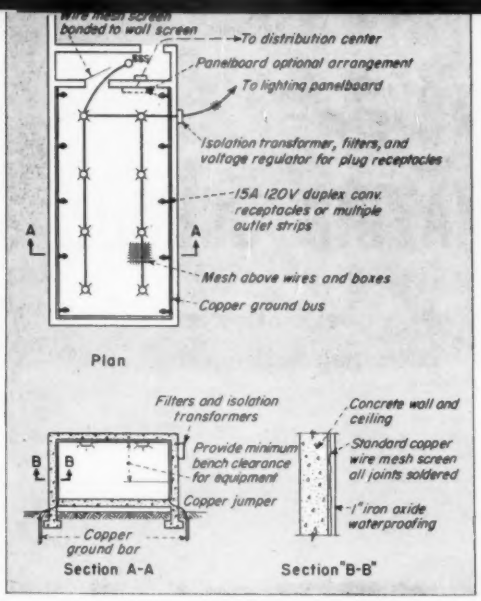


FIG. 1. Typical installation details for a counting room.

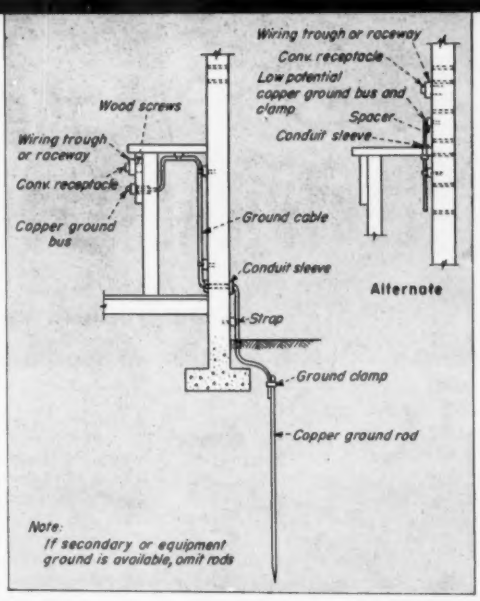


FIG. 2. Ground system installation details for instrumentation.

facilities of this type, often indicate the use of roughing regulation to take some load off the power supplies.

Shielding

Radiation shielding for personnel may not particularly concern the electrical design engineer, now, but it will become apparent that he should possess a general knowledge of its application and influence because equipment protection is merely an extension in degree of personnel shielding and is concerned particularly with gamma radiation. To assist towards this end, a brief reference to gamma radiation shielding which follows, will be found, in a measure, pertinent and perhaps serve as orientation to this rather complex but very interesting subject.

Shielding of a counting area is primarily for the preservation of the equipment accuracy. The effectiveness or degree of this protection against natural background radiation (radiation in the surrounding atmosphere but not emanating from the radioactive substance in process of study or utilization) is directly related to the sensitivity of the counting operation and the radiation strength of the sample. As the number of nuclear disintegrations (counts), of the substance under research or control begins to approach the count caused by the natural background radiation, the fluctuation (uncontrollable and not completely measurable at the sample) in the natural radiation count has a serious effect on the accuracy of the measurement.

Shielding the sensitive element of any counter for isotope tracer work against radiation, where the sample is in the millicurie level, is usually not necessary, unless it is a very weak radiation emitter. Shielding is essential when working with low microcurie samples in order to limit background nuclear radiation and to prevent interference with counting when the natural background is a large percentage of the counts and has unknown shifts during the counting operation. As the level of activity of radioactive material used in the vicinity (several hundred feet) of the counting work increases through the millicurie to the curie level, radiation shielding of increase in thickness will be needed up to two or three feet of concrete at the curie level at which point the room will probably require a maze entrance. Electromagnetic shielding (screen room type) is required only for extremely sensitive electronic counting and scaler equipment when working with small microcurie amounts of radioactive materials (see Fig. I for typical shielding). Metal pipes, ducts, and conduits which may act as antenna for undesirable radio and microwave, should preferably not pass through the counting area.

All power and lighting circuits should be carefully and separately grounded in compliance with the best and latest standard practice. All instruments should have an independent grounding system (completely separate from the regular power and light circuit) consisting of one inch by one quarter inch copper strip all around the benches, separately connected to a special ground system of one or more rods or pipes of a maximum of 25 ohms to ground and with ground rods preferably driven into the permanent ground water table.

Air Conditioning

The requirements for air conditioning are based on the ambient conditions needed by the equipment, to perform within the limits dictated by the measurements required. This implies that humidity is the most serious problem. Average design conditions would be a temperature range of 70° F to 80° F between winter and summer with a minimum 30% relative humidity and maximum of 60% relative humidity.

The above data are offered here as a concise treatment of about five years practice at Brookhaven National Laboratory with a background of pertinent current literature obtained during that period, and is intended only to indicate some of the primary considerations to be contemplated when designing a counting room, whether it be in a hospital, research or control laboratory or in industry. For general practice the electrical engineer will find these data helpful and comprehensive enough to assure satisfactory results at the present time.

At the IOWA ELECTRICAL ESTIMATING SCHOOL

Three-day course at Iowa State College gives contractors basic refresher on fundamental estimating techniques

DESPITE sleet, snow and icy roads, more than 25 electrical contractors from surrounding areas journeyed to Ames, Iowa to spend Feb. 19 through Feb. 21 in the engineering service building of Iowa State College. They spent their time and money for one reason—to learn more about estimating at what is reportedly the first electrical estimating school to be held in the State.

Originator of this "estimating short course" idea was A. H. Kohler, an electrical contractor of Hibbing, Minn., and a staunch proponent of good estimating practice. The over-all program was developed through the cooperation of the Iowa Electrical Association (a member of the Midwest Electrical Council) and the extension service and faculty of the College.

The curriculum, tailored to meet the needs of contractors operating in rural areas, covered electrical system design and estimating methods for homes, farms and small commercial buildings; plus a liberal offering of general information calculated to aid this specific type of contractor. Each session was divided into three specific parts: a general session with outstanding speakers in the related fields; an estimating problems laboratory for each category; and a "break" in classroom routine to visit product exhibits adjacent to the workshop.

At the general sessions, Gordon Tucker, manager, Midwest Electrical Council, Minneapolis, urged contractors to direct more attention to selling their services. Glenn Rowell, electrical engineer, Fire Underwriters Inspection Bureau, Minneapolis, outlined the history and development of the National Electrical Code. Rowell warned that this contractor's "encyclopedia" is a minimum safety regulation and not an adequacy standard.

An insight into the effect of lighting, color and ventilation on indoor living was given by A. N. Colby, science division, Iowa State College. Mark Brosier of the College engineering extension service discussed responsibility for safe wiring. Standards of REA needs were outlined by Elwood Oliver, education director, I.R.E.C.A., Des Moines. The subject of product liability insurance was also explored.

Coupled closely with home wiring design, was the blackboard demonstration of adequate wiring and its sales potential presented by Francis Armin, director of consumer education, National Adequate Wiring Bureau, New York City.

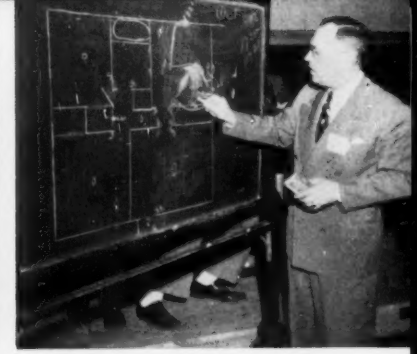
The problems laboratory dispelled any assumption that the course would be a "snap." Here the real work of

ESTIMATING CLASS begins three-day session on campus of Iowa State College at Ames.

BUCKLING DOWN to finish estimate recap before class adjourned for the day.

WATCH FOR LOOPHOLES like this, A. J. Clark (left) of Marshalltown, cautions C. E. Rodruck (Sheffield) who is working on store plan.

FARM WIRING distribution system layout was handled by Caroll Worlan, Iowa State College Agricultural Engineering Department.



HOUSE WIRING layout and estimating instructor was Charles Nelson, Nelson Electric Co., Ames.

A LESSON IN Adequate Wiring layout and promotion is given the class by Frances Armin, director of education and promotion, NAWB.

STORES AND SMALL commercial building layouts and estimating techniques were covered by Melvin I. Gordon, Gordon Electric Co., Albert Lea, Minn.

YOUNGEST STUDENT in the class was Wayne Throckmorton (left) who worked under watchful eye of his father, W. G. Throckmorton, Ames contractor.

the three-day sojourn was done. Those who registered for the course were supplied with residential and store plans and specifications, estimating forms, colored pencils, scales and the Collins Outlet Planner. As each instructor took over, the "students" buckled down to the task of designing an electrical system and estimating the installation cost. Basic, sound estimating procedures (takeoff, recap, labor and material units) were taught, step by step. When finished, the contractors realized (from this experience, if from nothing else) that there is no short cut to accurate estimating. When the final figures on a house wiring project were compared, the results indicated that there was still ample room for improvement in the group as a whole.

Charles "Chuck" Nelson, Nelson Electric Co., Ames, took the group through a step-by-step design of house wiring and estimating; left nothing to the imagination with respect to outlets and procedure. Melvin I. Gordon, Gordon Electric Co., Albert Lea, Minn., discussed a small store project with meager electric specifications; had the group estimate the electrical installation; cautioned them against the danger of using estimates prepared by others; emphasized the fact that all plans and specs must be carefully checked. Gordon listed, in detail, the various direct job costs which enter into an electrical construction project.

Caroll E. Worlan, agricultural engineer at the College, reviewed the increased use of electrical energy on the farm; took the group through a detailed design of a typical farm electrical system. Each man in the class worked along with the instructor, using plans furnished with the course.

Comments from the "students" at the end of the three-day school indicated that the effort was well worth while. Each man carried back to his own shop a much better understanding of estimating procedure; of the importance of accurate estimating in his business operation; of the service he can offer his customers through his design, technical and operational know-how.

This experiment in an electrical estimating short course may well be the forerunner of an annual school in this area. Later this year, the North Dakota Electrical Contractors Association plans to hold a similar session. Chances are good that other groups will follow suit. The net result will be that the smaller contractors in the rural areas will gain a much better appreciation of good estimating practice and better business operation.

INDUSTRIAL GROUNDING

How to ground industrial distribution systems and equipment to assure . . .

- *Safety to life and property by reducing the damages that may be caused by a ground fault*
- *Reduction of power failures due to transient overvoltages*
- *Ease of locating ground faults*
- *Economy of operation, particularly at the higher voltages*

By Eustace C. Soares, *Industrial Engineering Services, New York, N. Y.*

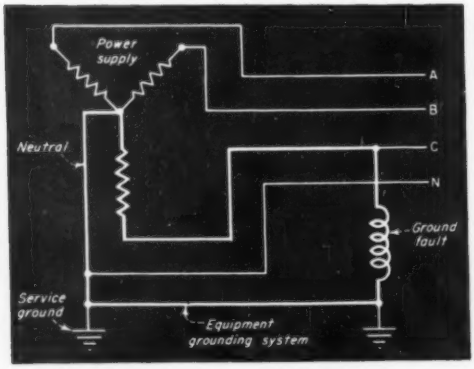
EFFECTIVE grounding protection for industrial power systems requires the proper installation of two distinct grounding circuits: one for the service or system ground; the other for the equipment ground. In the modern industrial plant, with distribution voltages as high as 13.8 kv, safe and proper electrical operation can be assured by careful attention to thorough protective grounding.

Fortunately, the problem of effective grounding is made easy by the National Electrical Code. Combining sound engineering analysis and practice, the NEC clearly sets forth what shall be grounded and what effective grounding requires. Certain provisions are mandatory requirements; some are recommendations; and others indicate permission.

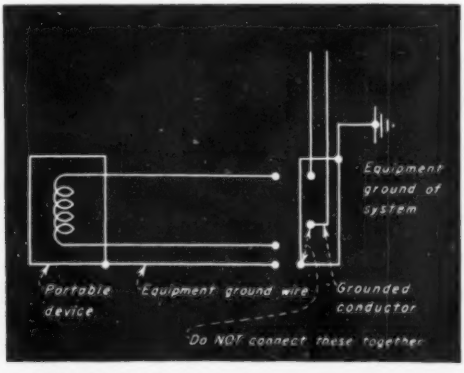
Paragraphs 2514 and 2551 of the NEC specify the general conditions for effective grounding. In substance, they state that a circuit shall be grounded (a requirement) in an alternating current system where maximum voltage to ground does not exceed 150 volts, or where a bare neutral is used in the service cable. Further, it is recommended that circuits be grounded where the voltage to ground does not exceed 300 volts; and higher voltage circuits may be grounded. Finally, the code requires that grounding be permanent, continuous, of ample capacity and low enough impedance to conduct the ground current that may flow, to limit the potential above ground and to facilitate the operation of the overcurrent devices in the circuit. Equipment and conductor enclosures must also be grounded in accordance with this last requirement.

Caution should be exercised, however, to avoid indiscriminate groundings, which may introduce hazards. Improper grounding can cancel the protection afforded by good grounding. For instance, if the frame of portable equipment is grounded and the neutral wire is also grounded at the load, a fault developing at the portable device may cause undesirably large currents to flow, endangering the operator. Another example of improper grounding would be the use of say one 500 MCM grounding conductor in a conduit without bonding the conduit and conductor at both ends. In such a case, the impedance of the grounding conductor may be many times the dc resistance, a value which easily may be sufficiently high to limit the fault current to a value too small to operate the overcurrent device. Although no code requirement covers this point, it should be given careful consideration.

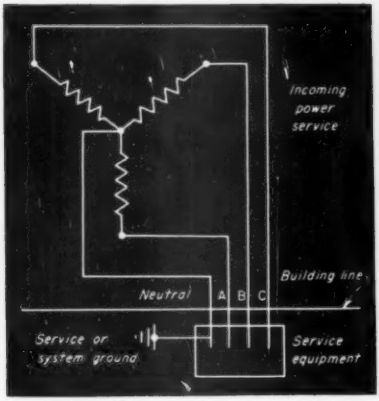
For properly grounding industrial



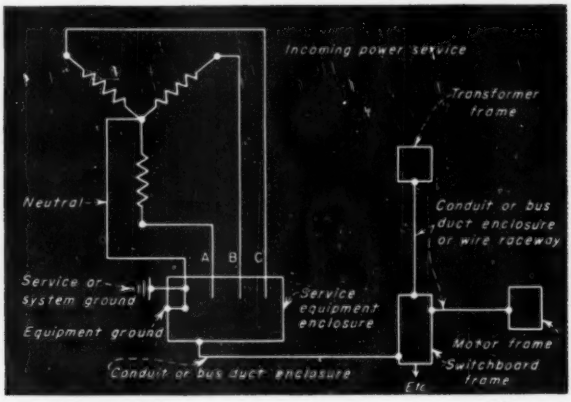
LOW IMPEDANCE of equipment grounding is necessary to pass sufficient current to operate the overcurrent device.



GROUNDED CONDUCTOR should not also be grounded at the load. To do so introduces a hazard to life and property.



SERVICE GROUND consists of intentional grounding of one conductor, usually the neutral.



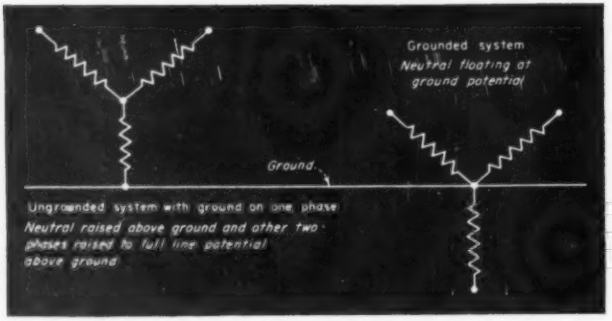
EQUIPMENT GROUND is a permanent and continuous low impedance bonding between conductor enclosures and apparatus frames.

distribution systems, two distinct types of grounds are required. One, the service or system ground, consists of the definite intentional grounding of one conductor of the system. Usually the neutral point of the generator or transformer winding is selected. This grounding, depending on the type of system and voltage, may be solid or through a current limiting reactor or resistor. The other type of ground, the equipment ground, is a permanent and continuous bonding together of conductor enclosures, apparatus frames and other non-current-carrying parts of the system. The equipment grounding network includes conduit, motor and transformer frames, bus duct enclosures, etc. It must be emphasized that the equipment ground is very important, and its impedance must be sufficiently low to facilitate the operation of the overcurrent devices in the circuit.

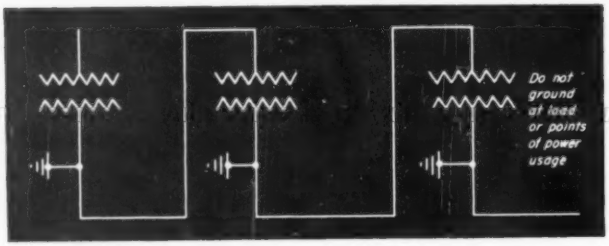
Perhaps the most significant appraisal of the value of effective grounding of industrial systems is made by comparison with an ungrounded system. In a grounded system, the neutral is floating at ground potential. In an ungrounded system, a fault ground will raise the neutral above ground and the other two phases to full line potential above ground. In such a case, the fault ground must develop into a phase-to-phase fault to operate the overcurrent device. But in a grounded system, a high impedance, in the ground return circuit will cause somewhat similar behavior, with even greater damage very likely. It is obvious, therefore, that the impedance of the equipment ground system, not the impedance of the service ground, must be sufficiently low to pass enough

TEN RULES FOR GROUNDING

1. **Ground at power source only, or at each power source if more than one. Do not ground at points of power utilization. Note: Power source may be point of generation, if within the building, or point where purchased power enters the building.**
2. **On low voltage circuits, equipment ground impedance must not limit fault current below rating of overcurrent device. Low impedance of equipment ground system is more important than resistance to earth.**
3. **Ground at each voltage level. (Refer to Rule 1)**
4. **Avoid having part of system ungrounded. Ground at each major bus section, if it is possible to separate each bus section.**
5. **Do not ground generator neutrals solidly, except on low voltage generators equipped with special coil bracing. Use grounding reactor on Y connected low voltage generators; a grounding resistor on high voltage units.**
6. **Neutral grounded systems require overcurrent devices on all phases. Only two overload relays required on motor starters.**
7. **Where system neutral is not available, a grounding transformer may be used if it proves economical.**
8. **Avoid use of 240 volt, 3-phase and 480 volt, delta connected systems if possible. Where such systems exist, use grounding transformer or operate ungrounded.**
9. **Size of service ground should not be less than 25% of main service capacity.**
10. **Equipment ground impedance must be low enough to pass at least twice and preferably three times the rating of the overcurrent device, at phase-to-ground voltage.**


Grounded system
Neutral floating at ground potential
Ground
Ungrounded system with ground on one phase
Neutral raised above ground and other two phases raised to full line potential above ground

GROUNDING PROTECTION is evident in comparison of grounded and ungrounded systems under a fault ground condition.



SYSTEM GROUND must be made at each voltage level and only at a power source, never at the point of power utilization.

current to operate the overcurrent device. Otherwise, the fault will continue and must develop into a phase-to-phase fault before the overcurrent device will operate. The conclusion is simple: only proper grounding offers protection.

From the above, the importance of the equipment ground is clear. In fact, a low impedance of the equipment ground bus system between enclosures and frames of apparatus and the grounding point is even more important than low resistance of the earth ground itself. Of course, this does not minimize the importance of a low resistance earth ground. But the necessity for low impedance bonding between equipment must be recognized.

In recent years, the Underwriters' Laboratories have given proper cognizance to the equipment ground system. Based on field experience with 15-ampere circuits served by BX cable, the UL now requires that BX cable armor (the equipment ground return circuit) have a maximum resistance of 1.5 ohms per 100 feet. To meet this requirement, some manufacturers of BX cable use a bonding strip. Before this limit was placed on the resistance of the armor, much damage to equipment and property resulted from fault currents which were too low to open overcurrent devices in the 15-ampere capacity circuits.

The application of a low impedance equipment grounding bond to large capacity circuits should also be given recognition. Inasmuch as the size of the circuit in no way alters the fundamental theory of circuit protection, some proper values must be set up to limit the impedance of the equipment ground return circuit for large capacity circuits. Such values must be in the order of 0.01 ohm. As an example, with all the 120 volts available in a 208/120 volt, 3-phase, 4-wire circuit, a ground impedance of 0.01 ohm would allow 12,000 amperes to flow. Allowing for joint resistance and fault impedance in a 4,000 ampere circuit with the overcurrent device set for 5,000 amperes, the value 0.01 ohm for the ground circuit impedance is not at all out of place.

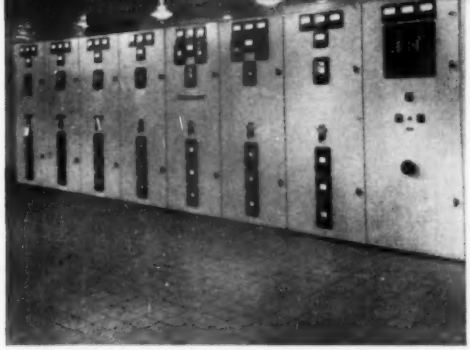
The NEC has always made it clear that the equipment ground impedance should be of sufficiently low impedance. However, the ruling has not been carefully observed due to a lack of appreciation of the problem. Although some values of impedance for large capacity circuits are set up in the code, the values are in need of revision; and the table will have to be expanded to include services above the present limit of 1,200 amperes.

As an overall measure, better specifications can do much to promote the practice of effective grounding techniques. Grounding should be covered in more detail, especially in low voltage systems. In large capacity installations, it should be specified that at least major runs of conduit systems be made with red lead on the joints. Other details might include: bonding of bus duct runs at each section with copper having 25% of the capacity of the main circuit; main ground bus bonding to each section of all switchboards; the use of grounding cables with at least 25% of the capacity of the main circuit; etc. In addition, careful attention should be given to equipment ground circuits where a long run of bus duct is used. In such circuits where magnetic material such as steel is used, the impedance must be taken as 10 times the dc resistance to allow for all the variables involved.

Although this discussion is by no means complete, the major elements of effective grounding have been covered. More specific details are available in the National Electrical Code sections on grounding.

System Voltages and Types of Grounding

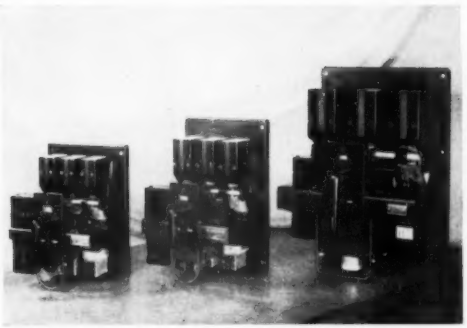
120 volts, 3-phase	Use dry type special wound transformers; Y connect and ground neutral.
240/120 volt, single phase	Ground middle tap of transformer.
208/120 volt, 3-phase, 4-wire	Ground transformer neutral.
480/277 volt, 3-phase, 4-wire	Ground transformer neutral.
2400 volts and above	Use grounding resistor for Y connected generators and transformers; a grounding transformer plus resistor for delta connected generators and transformers.



MODERN CONTROL CENTERS, like this installation in a large paper mill, concentrate all generating and distributing switchgear in one convenient location to facilitate supervision and regulation of electrical performance.

DRY-TYPE TRANSFORMERS, like these 13.8-kv ASL units, are installed in several of our atomic-energy plants. Self cooled, these 3-phase transformers have capacities to 7000-kva. With forced-air cooling, output is 10-million va.

Protection For Industrial Power—PART 2



THIS GROUP OF AIR CIRCUIT BREAKERS are type DB with interrupting capacities of 15-, 25-, and 50-thousand amperes. Overcurrent tripping devices can be seen at the bottom of each assembly.

Selection and application of fuses, relays and breakers to protect low voltage circuits, secondary substations, primary feeders, primary substations and industrial generating plants depends upon a basic understanding of the operating characteristics of protective devices.

By H. G. Barnett, *Distribution Engineer*
and J. E. Barkle, *Central Station Engineer*
Westinghouse Electric Corp., E. Pittsburgh, Pa.

PROTECTION of primary-feeder circuits in a radial system is similar to that described for secondary circuits (Part 1). The main difference is the higher voltage of the circuit which generally necessitates the use of instrument transformers and relays. However, the fact that fuses are used for protection of primary feeders in many cases cannot be overlooked. The fuse application is based on coordination of ampere-time characteristics of fuses with those of protective devices on the load side of the fuses.

Some advantage is gained since there is a transformer representing a major portion of system reactance between the fuse and the low-voltage protective devices. The transformer limits the short-circuit current through the fuse for a low-side fault to a fraction of the current for a high-side fault. Thus, a fuse can be applied to provide fast cleaning of a primary-feeder fault and still allow sufficient time for coordination with low-voltage protective devices. The fuse usually cannot be relied upon to provide thermal overload protection for the secondary-substation transformer and still coordinate satisfactorily with protective devices in the low-voltage circuits.

Fuses are single-phase protective devices and present the possibility of single phasing of the circuit. In the event of blowing one of the fuses, the remaining two phases are still energized and, depending on the type of circuit used, can continue to carry the load under an abnormal condition. This can result in severe negative-sequence currents and voltages, causing overvoltage and overheating and vibration of motors. It is advised that some means be provided for detecting a single-phase condition before extensive damage can be done.

Protection of primary-feeder circuits

can be better accomplished using circuit breakers and relays. Simple overcurrent relays are used in most cases. Advantage is often taken of the difference between primary and secondary short-circuit currents, an instantaneous overcurrent relay being set to detect primary faults only and causing instantaneous tripping of the primary-feeder circuit breaker for all major primary faults. Faults in the secondary-substation transformer and on the low-voltage side are detected by a time-delay overcurrent relay set to coordinate with low-voltage protective devices.

Multiple Industrial Feeders

Some types of industrial plant distribution systems require multiple primary feeders to take full advantage of the system design. The loop and multiple-feeder forms of primary-feeder systems provide multiple feed and are commonly used. For example: a primary-selective radial system requires at least two primary feeders to supply each secondary substation (Fig. 5). This is likewise true in secondary-selective radial systems (Fig. 4, Part 1). In either system, each primary feeder normally carries approximately half the total load but under emergency conditions carries the entire plant load. There is a wide variation in primary feeder loading condition between half of the plant load and all of the plant load. Thus, relaying used with the primary-feeder breaker must take this load variation into account and in extreme cases may be complicated. The complication can usually be overcome by using an instantaneous overcurrent relay to provide fast clearing of primary-feeder faults. A time-delay overcurrent relay then can be coordinated with secondary protective devices to provide back-up protection for low-voltage faults and to detect faults in the secondary-substation transformer. In any event, the time-delay relay setting must take into account the maximum load that may be carried by the circuit and in rare cases that may mean that the relay setting must be adjusted for different plant operating conditions.

This same relay problem exists when multiple radial feeders supply a network system. The principal difference is that the load transfer from one primary feeder to the remaining primary feeder or feeders is automatically performed in the network system. This automatic transfer must be taken into account in choosing and setting the primary-feeder protective relays.

Multiple feed can also be provided by using a radial-loop system (Fig. 6). This is frequently done in the banked-secondary system or in a simple radial system where economical means of isolating a primary-feeder fault with minimum secondary-substation outage is required. The loop is invariably manually sectionalized, using a load-break disconnect switch at each secondary substation. This form of loop system does not justify the use of more than one primary-feeder breaker, that opens for any primary-feeder or secondary substation transformer fault. The loop is manually sectionalized to isolate the faulted section and the circuit breaker reclosed. Thus the relaying of the primary-feeder breaker is the same as in the simple radial primary feeder and involves coordination of the overcurrent relay at the primary-feeder breaker location with the secondary-protective devices.

The National Electrical Code has set up limits within which individual overcurrent protection on the primary side of the secondary-substation transformers can be omitted. (Section 4512, 1951 edition.) Basically the Code permits the omission of individual primary overcurrent protection when there is adequate secondary overload protection for the transformer, and the primary-feeder breaker relaying can be set to detect a fault in the low-voltage side of the transformer. The Code, if interpreted literally, permits connecting only five identical transformers to the same primary feeder without the use of individual overcurrent protection in the primary side of the transformers when the transformers

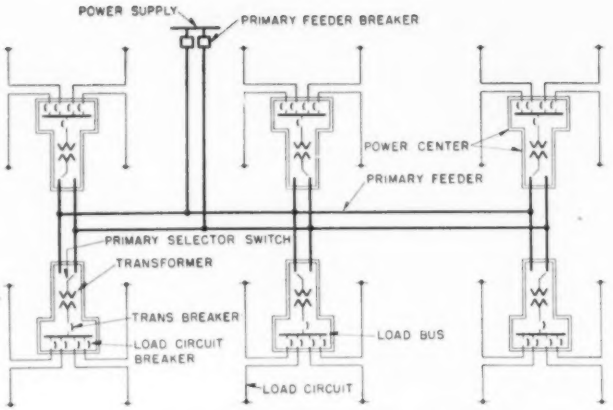


FIG. 5. PRIMARY-SELECTIVE RADIAL SYSTEM

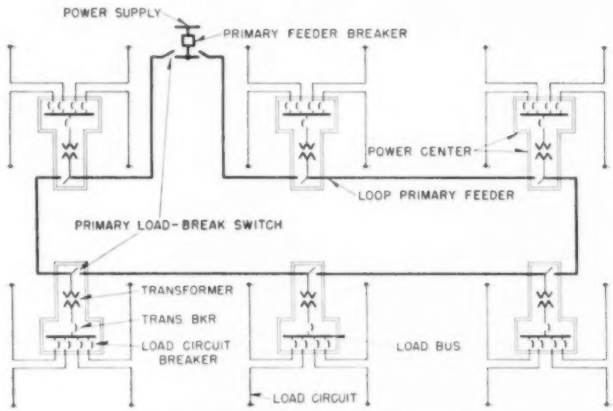


FIG. 6. LOOP PRIMARY RADIAL SYSTEM

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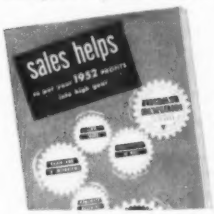

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impedance is 6% or less. If the transformer impedance is between 6% and 10% it is permissible to connect only three transformers of like size to the same primary feeder. While the Code requirement is approximately correct at 6% and 10% transformer impedance, the regulation is unnecessarily restrictive for other values of impedance, and other numbers of like transformers can be connected to a primary feeder when the transformer impedance is different than 6% to 10%. In many cases the over simplification imposes an economic penalty on the distribution system arrangement.

Primary Substation

Basically the application of protective devices at the primary substation follows the same principles involved at the secondary substation. The main differences are in the size of the substation transformer and the method of supply to the substation. The method of supply usually is established by the available facilities of the utility supplying power to the industrial plant and may be beyond control by the industrial system designer.

If a main transformer breaker is used in a simple radial system, overcurrent relaying can be used to trip this breaker as back-up protection for the primary-feeder breakers. The main function of this breaker from a system protection standpoint is to detect and isolate faults on the primary-substation bus. The relaying for the breaker, however, must be coordinated with other protective devices in the system. Thermal overload protection for the primary-substation transformer can also control this breaker.

Where the unit-substation type of construction is used, it is common practice to eliminate the transformer breaker. This is justified by the compactness and extreme reliability of the unit-type equipment, which makes the possibility of a primary-substation bus fault remote. In large primary substations the possible use of bus and transformer differential protection should be considered. Justification of their use must be based on the premium which can be paid for the additional insurance provided. In special cases differential schemes combining the transformer and bus protection can be devised with a consequent saving in the investment in protective features.

If the subtransmission system supplying the primary substation consists of a single radial line, no protection is ordinarily provided at the substation high-voltage terminals with the possible exception of a high-voltage fuse that may be associated with a disconnecting device. In cases where other independent loads are supplied over the same single radial line, the utility may require an automatic switching device at the primary-substation high-voltage terminals to protect the incoming line against outage caused by faults in the industrial system. This breaker usually can be relayed by overcurrent relays coordinated so that it does not trip for faults that should be cleared by primary-feeder breakers or other protective devices in the industrial-plant distribution system. The high-voltage breaker can provide back-up protection for faults on the industrial system, and where transformer or bus differential protection is used, the breaker can be controlled by the differential relays. When the high-voltage breaker is used in the primary substation, there is little justification for using a breaker in the transformer secondary leads. The protection normally provided by the secondary breaker can be provided by the high-voltage breaker resulting in one less step in the relay coordination.

Special Considerations

Multiple radial feed or a loop-type feed may be provided for the primary substation and these introduce different relay problems. If the multiple radial feed is normally operated with only one circuit supplying the primary substation, transfer control can be provided to automatically connect the primary substation to another feed in case of outage of the normal feed. The automatic control includes an undervoltage relay with time delay, which controls closing of the emergency supply breaker when loss of voltage occurs on the normal supply. These controls are usually arranged so that one incoming line is considered the normal supply, and when the normal supply is in service, the substation is always connected to it. Thus after a transfer to the emergency supply has taken place, the automatic control reconnects the substation to the normal supply when the normal-supply voltage is restored. The restoration of normal supply also can be done by manual control to control the time at which it occurs.

Where two or more incoming lines are used to supply the primary substation under normal conditions some form of directional overcurrent relaying can be used to advantage to prevent an outage of all incoming lines for a fault on one. The directional overcurrent relays can be applied and set independent of the industrial plant to detect faults on the incoming lines.

Arrangements of primary-substation

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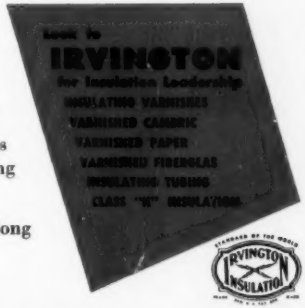

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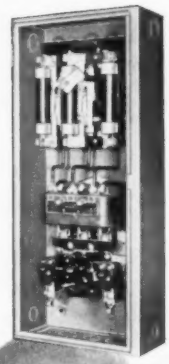
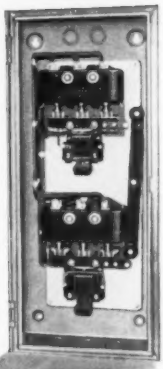
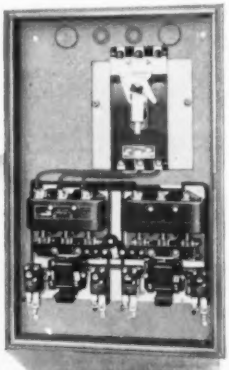


Bulletin 6018
Combination Non-Reversing
AC Magnetic Starter
with Fusible Disconnect Switch



Bulletin 6031
Reversing
AC Magnetic Starter
without Overload Protection

Bulletin 6013
Non-Reversing
AC Magnetic Starter



Bulletin 6060
Combination Multi-Speed
AC Magnetic Starter
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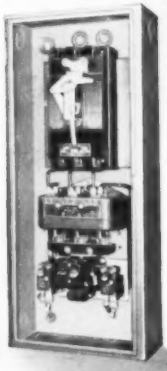

Bulletin 6030
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AC Magnetic Starter
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CLARK Type "CY" Sizes 2 & 3 —the starter with the revolutionary new arc-quenching principle.

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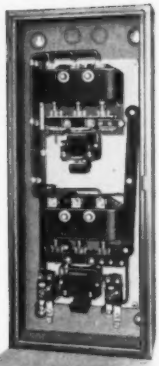

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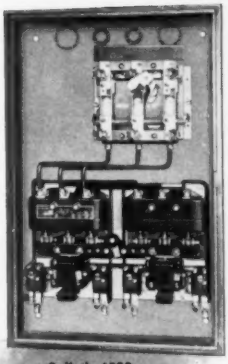
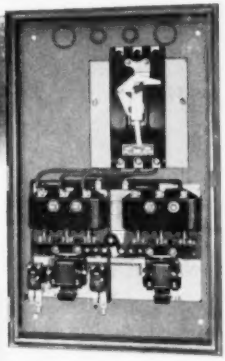
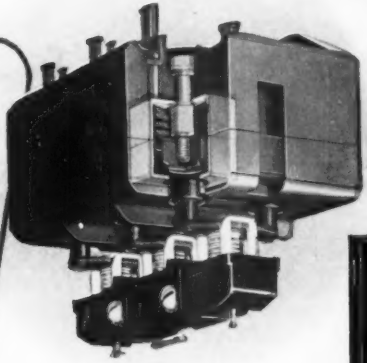


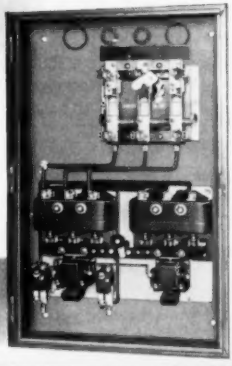
Bulletin 6058
Combination Multi-Speed
Magnetic Starter with
Safety Switch

Bulletin 6040
Combination Reversing
AC Magnetic Starter
with Air Circuit Breaker

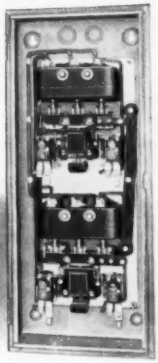




Working Heart of the CLARK Type "CY" Starter with cut-away showing magnetic circuit, arc shield and blow-out coil.



Bulletin 6038
Combination Reversing
AC Magnetic Starter
with Disconnect Switch



Bulletin 6050
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Magnetic Starter

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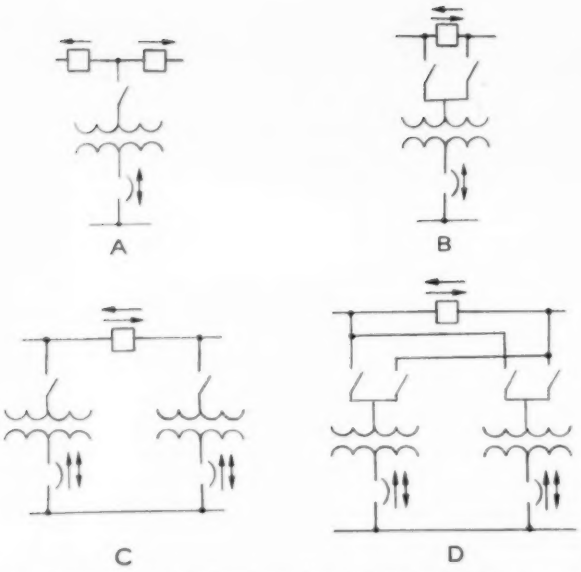

FIG. 7. METHODS OF CONNECTING PRIMARY SUBSTATIONS to an automatically sectionalized loop supply circuit.

high-voltage switching for loop-type incoming supply are shown in Fig. 7. The design depends on whether the primary substation uses one or more transformers. In a single-transformer primary substation, either one or two incoming line breakers may be used (sketches A and B). The use of two breakers prevents an outage of the primary substation for an incoming-line fault, but the single-breaker arrangement results in a primary-substation outage until manual switching reconnects the transformer to the good loop section. Directional relaying is normally used on the high-voltage loop breakers as shown, and the coordination of these relays is relatively simple. It should be noted, however, that some of the loop directional relays will have to coordinate with primary-substation secondary relaying. This generally does not present much of a problem. The coordination of directional relays around the loop is invariably determined by the utility operating requirements. Where two primary-substation transformers are used, a single high-voltage breaker is sufficient (sketches C and D). As indicated in C, one primary-substation transformer is removed from service in the event of an incoming-line fault since the transformer is considered a part of the loop section. In diagram D, the affected substation transformer can be reconnected to the good loop section during an outage of the normal loop supply. Again directional relaying is invariably used on the loop-circuit breakers, and the settings are determined by the utility. In any of the cases illustrated in Fig. 7, other forms of relaying such an impedance or pilot-wire protection can be used on the high-voltage breakers but their use frequently is not justified.

Industrial Generation

The effect of generation within the industrial-plant system on the protection problem is not covered here in detail. However it is well to remember that the effect of industrial generation on the system protection and relaying depends to some extent on the point of parallel connection of the industrial generation with the incoming utility supply. This can be at the primary-substation level or at the secondary-substation level. Protection of the industrial generators can be obtained by using differential protection or voltage-restrained overcurrent relaying. Voltage-restrained overcurrent relaying has some advantage in that a degree of back-up protection can be provided for faults in the industrial-plant system. However, it is not as sensitive as differential protection for the detection of faults in the generator.

The principal problems introduced by industrial generation are those of parallel operation of two generating systems. It may be necessary to take precautions to prevent supply of power by the industrial generation to the utility system during conditions of reduced generation on the utility system. Directional power relays on the incoming supply from the utility have been used for this purpose. Other possibilities are under-frequency and over-voltage protection to trip the breaker in the incoming supply from the utility.

In some cases industrial generation at the secondary-voltage level is encountered. These cases do not represent as great a problem as generation at the primary-feeder voltage level but the same basic considerations are involved.

System Grounding

The general subject of industrial system protection can involve many aspects, such as surge protection and grounding. The problems involved in surge protection are much too complex to be discussed in this article and, moreover, system relaying is not particularly affected thereby. But some consideration should be given system grounding since it affects the short-circuit protection of industrial systems.

The present trend is toward the use of grounded systems. Industrial-system fault protection is not necessarily complicated by system grounding and may actually be simplified. Generally speaking the ground source should be large enough to provide sufficient ground-fault current for fault detection. When this is done the amount of damage caused by a ground fault is limited by the rapid clearing of the fault. The hazards of excessive transient overvoltages that can be encountered on an ungrounded system can be eliminated by proper choice of ungrounded impedance. There are many cases on record of multiple ground faults on ungrounded systems that have caused far greater damage to equipment and circuits that would have been encountered had the system been properly grounded and each ground detected separately when it occurred.

Grounding is particularly applicable to the primary-feeder systems in industrial plants, especially when a network system is used so that outage of a primary feeder does not interrupt power supply to the plant loads. The hazards of transient overvoltages and excessive damage due to multiple grounds is not as great in the low-voltage secondary system and grounding may be considered unnecessarily in some cases.

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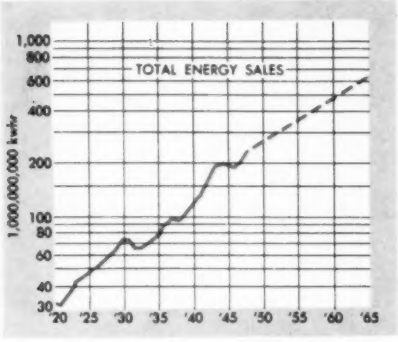

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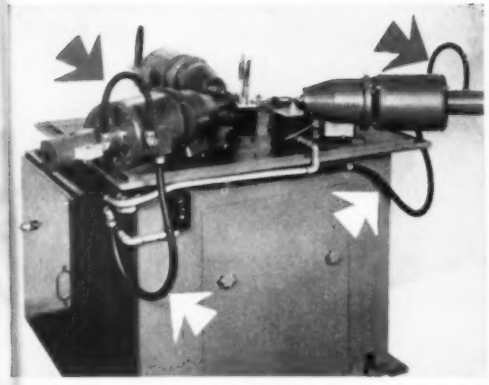

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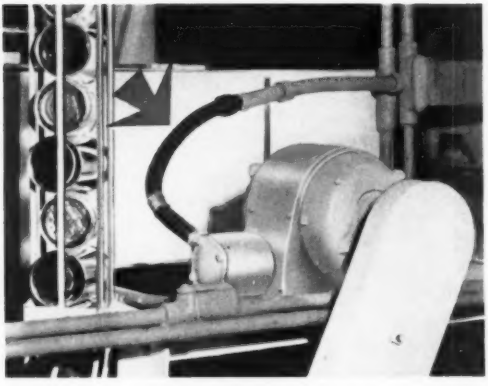

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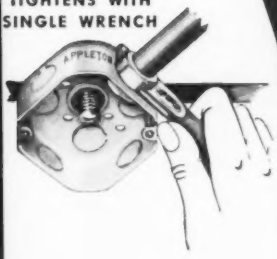

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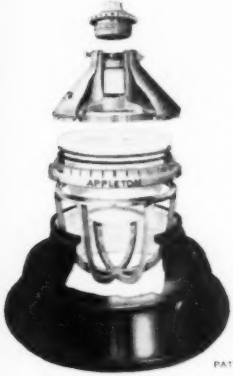

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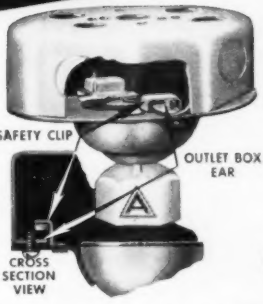

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the right cable for the job

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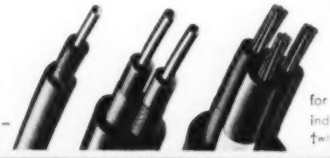


available in all sizes — from large to small — one to three conductors — up to 5000 Volts

for traffic control, airport† power and lighting, mines, industrial plants, railroads, street lighting and many other uses

†when ordered to CAA Specification L-824

CALL GRAYBAR FIRST FOR . . .

GRAYBAR Everything Electrical

PRICE $385.00—1/2 TO 2-INCH

BEAVER

MODEL "E"

pipe and bolt machine

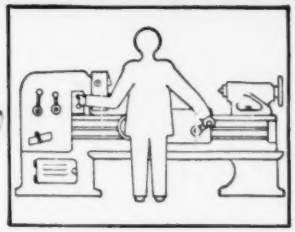
• Lightweight, economical Beaver Model E, weighing 185 lbs., cuts, threads and reams all kinds of pipe . . . from ⅛ to 2-inch. Using a drive shaft and geared tools, it cuts and threads all sizes of pipe from 2½ up to 8-inch. It threads bolts and rods up to 1½-inch in one cut; up to 2-inch in two cuts. With the wheel-cutter it cuts off bolts and rods up to ⅞-inch . . . with the knife cutter (special) it cuts, grooves or bevels ½ to 2-inch pipe.

In addition to the features illustrated, the Beaver Model E has a one-piece weldment base, a high-speed weather-proof motor mounted to permit a cooling flow of air, a reversible oil pump, quick opening die-heads—with a choice of 195 kinds and sizes of dies; ball-bearing, self-centering wheel and-roller cutoff, for pipe or bolts; safety switch lock; heavy duty 7½-inch chuck; eccentric cam-type pipe support; and a choice of 110/115 or 220/230 volt universal motor for use on AC or DC, 25 to 60 cycle.

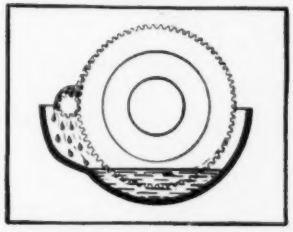
When you buy the Beaver Model E you are buying the top quality pipe and bolt machine in the lightweight economy field. Write for our latest catalog for information on the complete line of Beaver pipe tools.

"Over 50 Years of Friendly Service"

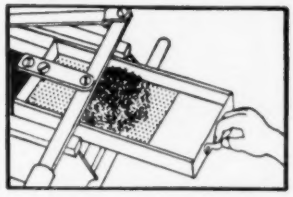
BEAVER PIPE TOOLS
282-300 Dana Ave.
Warren, Ohio, U.S.A.



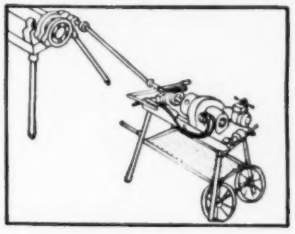
Right-handed — like a lathe — conforming to standard machine tool practice. All controls at operator's finger tips.



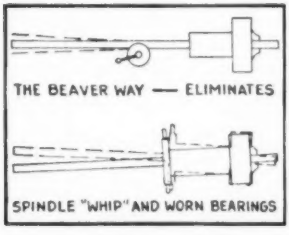
The gears run in oil! Quieter running and longer lasting because less friction. Only Beaver offers this in the low price class!



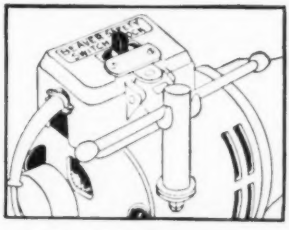
Handy chip tray—removable for cleaning—perforated to facilitate prompt oil circulation.



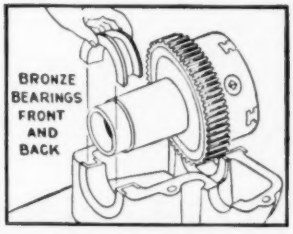
A rugged welded steel stand is available for the Model E. Steel or rubber-tired wheels. Cut shows how large pipe is threaded with geared threader and drive shaft.



Exaggerated view showing why pipe support should be independent of the spindle to prevent spindle "whip," worn bearings and flat-sided threads.



Safety Switch Lock—prevents starting motor with wrench in chuck. Protects operator and machine from injury and damage.



Renewable bronze bearings on both ends of the spindle insure long life and proper spindle alignment. Easily replaced!

CALL GRAYBAR FIRST FOR . . .
Everything Electrical

BI-SEAL SELF-BONDING ELECTRICAL INSULATING TAPE

BI-SEAL CUTS SPLICING TIME AND COST

- NO STICKY ADHESIVES . . . EASY TO APPLY IN CLOSE CLEARANCES
- NO RIGHT OR WRONG SIDE . . . BOTH SIDES USABLE
- NO TACKY SURFACES TO PICK UP DUST OR FOREIGN MATTER
- WILL NOT TANGLE OR STICK TOGETHER
- REQUIRES NO SPECIAL APPLICATION TECHNIQUES
- CAN BE STORED INDEFINITELY

Here is the *multi-purpose* electrical insulating tape for wire or cable splicing . . . the tape that meets your strictest requirements for many unusual as well as innumerable ordinary applications. BI-SEAL offers you complete and lasting protection against moisture, acids, alkalies, sunlight, corrosion, fungus and ozone. These outstanding characteristics, plus Bi-Seal's excellent electrical properties, make it ideally suited for a broad range of applications in the Communications, Electronics, Public Utilities, Electrical Contracting and Electrical Maintenance fields.

WRITE TODAY for free illustrated booklet, "Insulating Wire and Cable Splices with Bi-Seal Self-Bonding Electrical Insulating Tape."

CHECK THESE BI-SEAL FEATURES:

- Self Bonding
- Moisture Resistant
- Outstanding for Low Temperature Application and Performance
- High Dielectric Strength
- Superior Aging Properties
- Conforms to Irregular Shapes
- Corrosion and Chemical Resistant
- Performs Efficiently on Any Insulation

BISHOP MANUFACTURING CORPORATION

10 CANFIELD ROAD • CEDAR GROVE, N. J.

"Manufacturers of Electrical Insulation Since 1847"

CALL GRAYBAR FIRST FOR . . . Everything Electrical

with BENJAMIN'S complete line there is no trouble *at all* getting

Task Matched Lighting Installations

In the 400-page Benjamin Catalog, you'll find just the lighting equipment you need to provide lighting that is matched to the task.

No need wasting time trying to locate a source for this or that special unit . . . or figuring out an acceptable substitute. If the unit is needed in industrial and utilitarian lighting . . . you'll be sure to find it in the Benjamin Line!

You'll be sure to find that, not only is the unit you select correct in lighting design, but equally important, it is designed for extra long life operation under the special operating conditions for which it is intended. Whether it be for ordinary industrial use, installation in corrosive, dusty or explosive atmospheres, for indoor lighting or outdoor . . . the Benjamin Unit designed for the task can be depended upon to meet highest expectations for finest performance.—Benjamin Electric Mfg. Co., Dept. H, DesPlaines, Ill.

"MAGNA-FLO" SYSTEMS

Provide Over 300 Combinations for Matched to the Task Lighting.

Like all Benjamin Lighting Systems, the "Magna-Flo" line for use with the three T12 Slimline Lamps is complete! It is so complete because, basically, just three channel sizes and four types of reflectors form the backbone of almost unlimited systems to match any industrial lighting task.

R5930

"VAPOLETS"

For locations with atmospheres containing moisture, non-hazardous dusts or vapors.

Available in three types of reflectors—Dome, Shallow Dome and Symmetrical Angle. These reflectors thread on to the vapolet housing by cast-iron ring. Choice of glass globes: plain, opal, heat-resisting, ruby, etc.

EXPLOSION-PROOF

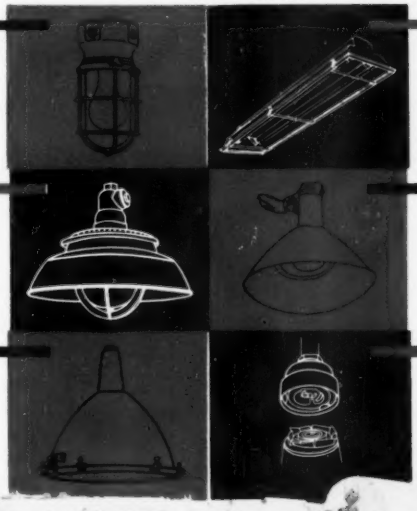
For locations listed by U. L. as Class I, Group C and D hazardous locations.

For lighting locations involving explosive atmospheres or explosive inflammable dusts, there is a complete line of Benjamin Explosion-Proof Units, available in a choice of reflectors, Dome, Flat Cone, Bowl, Symmetrical Angle; also choice of mountings.

"STEELITES"

For locations where keeping lighting levels up and upkeep down is a real problem.

An armored clad unit consisting of specially designed alzak aluminum reflector enclosed in a protective steel housing and a hinged, tempered glass cover which seals against dust, moisture and corrosive fumes.



"VAPOR-TITE" FLUORESCENT

For lighting locations where excessive amounts of non-combustible vapor or dust are present.

Approved as vapor tight by U. L., a one-piece porcelain enameled unit with hinged glass cover and easily accessible control equipment. Available in standard and angle mountings; also Plexiglass covers.

"ELLIPTO-LITE"

Most popular type floodlight ever designed for outdoor and protective flood-lighting.

For protective floodlighting of factory yards and grounds and for lighting outdoor work areas. A porcelain enamel floodlight with auxiliary inner aluminum reflector; available with a removable hood construction, lowering attachment, choice of mountings.

"TURNLOX"

Detachable Hood Construction available with 7 types of Incandescent Reflector Units to speed maintenance and cut costs.

Permits removal of lamp and reflector as one unit for cleaning on floor or at bench.

For complete details on this equipment or any of the more than 2,000 Benjamin Lighting Units CONSULT YOUR BENJAMIN CATALOG . . . the encyclopedia of industrial Lighting.

CALL GRAYBAR FIRST FOR . . . Everything Electrical

For Reduced Maintenance Costs

THE ANSWER IS BRYANT

Fluorescent Starters

BECAUSE:

- each Bryant starter is individually inspected
- each Bryant starter is tested on an actual lamp load.

Order your Bryant starters from this handy selector chart. A complete line for every application

STANDARD TYPE

LAMP SIZE, WATTS	4, 6, 8	13, 20	25 Circlare	30, 40	32 Circline	85, 90, 100	85, 90, 100
CATALOG NUMBER	FS5	FS2	FS25	FS4	FS12	FS85	FS85-4
NUMBER OF PINS	2	2	2	2	2	2	4

"NO-BLINK" AUTOMATIC RESET TYPE

Restores circuit as soon as new lamp is inserted

LAMP SIZE, WATTS			40		85, 90, 100	85, 90, 100
		CATALOG NUMBER	FS4-NA		FS85-NA	FS85-NA4
		NUMBER OF PINS	2		2	4

"NO-BLINK" MANUAL RESET TYPE

Circuit restored by pushing small red button in top of starter, after new lamp has been installed.

LAMP SIZE, WATTS	13, 20	30	40		
CATALOG NUMBER	FS20	FS30	FS40		FS850
NUMBER OF PINS	2	2	2		4

BRYANT
SUPERIOR WIRING DEVICES

Listed as Standard by Underwriters' Laboratories, Inc.
Order Bryant Devices from your Electrical Distributor

THE BRYANT ELECTRIC COMPANY • BRIDGEPORT 2, CONNECTICUT • CHICAGO • LOS ANGELES

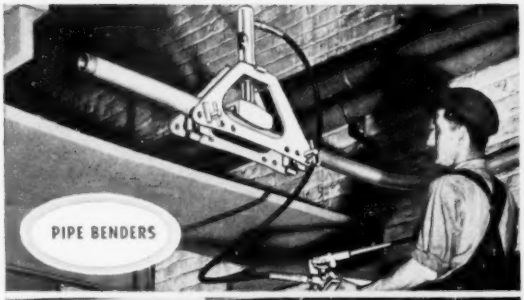
CALL GRAYBAR FIRST FOR . . .

Graybar Everything Electrical

"This hydraulic equipment keeps my men happier... more productive"

TO BEND RIGID OR THIN-WALL CONDUIT

A Blackhawk hydraulic bender creates striking savings! It's *really* portable . . . and just plain handier! Works in any position — on its side or upright, on table or floor, on existing runs. With the hydraulic pump and ram separated by a flexible hose, a man can move around — "jockey" the pipe with one hand — sight along it if necessary . . . without stopping the pumping.

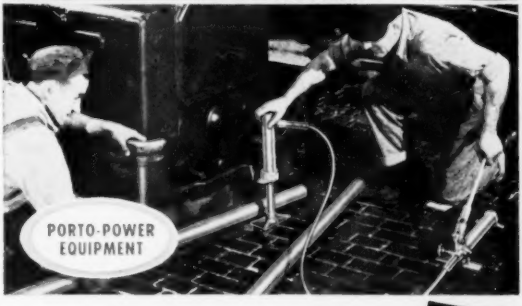


TO DRIVE KNOCK-OUT PUNCHES

Look! No wrench to swing. No knuckle busting. No more distorted boxes. Now you can drive knock-out punches with the amazing "Porto-Power" hydraulic jack. It's 60% faster! Conduit openings are *neat* — workmen are happier, safer — dies last six times longer!

TO LIFT MACHINERY, PULL PULLEYS

The same "Porto-Power" hydraulic jacks that serve Blackhawk Electrician's Equipment lick dozens of allied jobs. With its all-directional ram, it can lift, pull, press, clamp, bend or push. "Porto-Power" wipes out scores of time-wasting construction and maintenance methods. Don't do it the hard way — *do it the hydraulic way!*



Yes, Blackhawk hydraulic equipment will make *your* crew happier, more productive. Today more than ever, it's important to give your men the best tools possible. And if you want to motorize your hydraulic equipment, the inexpensive P-182 portable electric pump provides finger-tip control, cuts manual labor, triples output. Order Blackhawk equipment from your wholesaler.

BLACKHAWK

HYDRAULIC PORTO-POWER EQUIPMENT

CLIP THIS COUPON AND MAIL TODAY!

BLACKHAWK MFG. CO.

Dept. P-2042, Milwaukee 1, Wis.

Please rush free Catalog 50B on Blackhawk Electrician's Equipment

Name.....

Firm.....

Address.....

City..... Zn..... State.....

CALL GRAYBAR FIRST FOR . . .

Everything Electrical

try BRADY QUIK-LABEL WIRE MARKERS on your job!

ELIMINATE

- X GUESS WORK
- X RINGING OUT
- X NOTCHING
- X TAGGING

SAVES TIME
SPEEDS UP YOUR WORK

Leading electrical contractors, electricians and maintenance men are now using handy Brady Wire Markers, to mark and identify cables, wires, circuits, leads, switches, etc. They're simple and economical to use, quickly applied, easily read and save hours of time on any job.

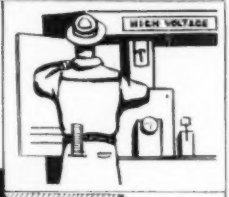
Over 1000 different markers in stock for immediate shipment, including all standard NEMA colors, codes, symbols and numbers. Specials made for your particular requirement.

Brady Quik Labels are self adhesive, stick to any surface without moistening — even when pulled through conduit. They're tough and durable — Silicone coated to resist dirt, grease and grime. Low in cost.

Send for FREE SAMPLES and catalog, today!

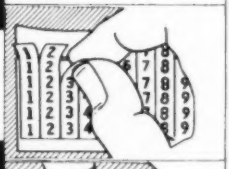
Handy DISPENSER Card

Brady Wire Markers come mounted on handy DISPENSER cards, with an exclusive Starter-Strip permitting fast removal. Cards can be carried in pocket or tool kit.



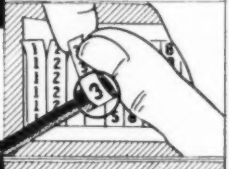
1. PEEL

Pull back Starter Strip and labels peel off in a jiffy. NO SHARP TABS TO CUT FINGERS.



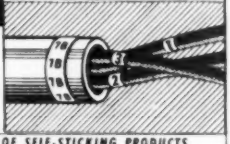
2. APPLY

BRADY MARKERS stick without moistening. Simply wrap around wire and you have positive, permanent identification.



3. IDENTIFY

Thousands of uses and applications. Clear, legible numbers, letters, symbols and colors leave no room for doubt.



Brady
self-sticking identification products
NEW
FREE CATALOG
Illustrated catalog that should be in every electrician's file. Show all Brady QUIK-LABEL products, and helpful, time saving ideas. Actual, useable samples included.

WIRE MARKERS
PIPE MARKERS
SAFETY SIGNS
PRINTED VINYL TAPE
MASKS & STENCILS

MANUFACTURERS OF SELF-STICKING PRODUCTS

W. H. BRADY COMPANY

EST. 1914

1617 E. SPRING STREET • CHIPPEWA FALLS, WIS.

CALL GRAYBAR FIRST FOR . . .

GRAYBAR Everything Electrical

Reduce inventories, cut costs, with new BullDog Vacu-Break Safety Switch Line

New BullDog *Master Line* cuts out duplication. Just 37 Type A switches now let you fill any Type A, C or D application *at C prices!*

Savings! Easy handling! Fast installations! They're all yours with the new, *standardized*, streamlined BullDog Vacu-Break Master Safety Switch line. Now, only 37 non-duplicating Type A switches fill any possible A, C or D requirement. They replace hundreds of confusing catalog numbers, let you reduce inventories, cut costs. And, because they are mass-produced and standardized, these Type A switches sell *at C prices*—a value unmatched anywhere. Check all the tremendous advantages this new line offers you, below. And place your *next* safety switch order with your local BullDog Distributor.

LOW PRICE . . . a Type A switch at Type C prices!

NEW VERSATILITY . . . only 37 Type A devices fill any A, C, or D application. Each switch replaces any one or several formerly stocked!

LOWER INVENTORIES . . . fewer items to stock; a more *balanced* inventory with less investment!

SAVINGS IN SPACE . . . no duplicating items to tie up storage space!

SIMPLE TO ORDER . . . only 37 catalog numbers instead of hundreds. Less time wasted on long, confusing catalog lists!

EASY INSTALLATIONS . . . simplified mounting, anywhere. Ample knockouts and generous wiring space for savings in time, materials!

TOP PERFORMANCE . . . self-aligning Clampmatic Contacts give unmatched quick, positive, *bolt-tight* connections!

LESS MAINTENANCE . . . Exclusive Vacu-Break protection practically eliminates burned or pitted contacts.

GREATER SAFETY . . . Vacu-Break chamber smothers arcs instantly, protects against high contact temperatures.

HIGH QUALITY . . . listed by Underwriters. Quality-engineered and -built throughout!

For full details on this revolutionary safety switch line, see your BullDog Distributor or write for Bulletin 514.

BULLDOG

BULLDOG ELECTRIC PRODUCTS COMPANY
DETROIT 32, MICHIGAN • FIELD OFFICES IN ALL PRINCIPAL CITIES
IN CANADA: BULLDOG ELECTRIC PRODUCTS OF CANADA, LTD., TORONTO

PIONEERS IN FLEXIBLE ELECTRICAL DISTRIBUTION SYSTEMS

1902-1952 . . . SERVING INDUSTRY FOR 50 YEARS WITH FINER ELECTRICAL PRODUCTS

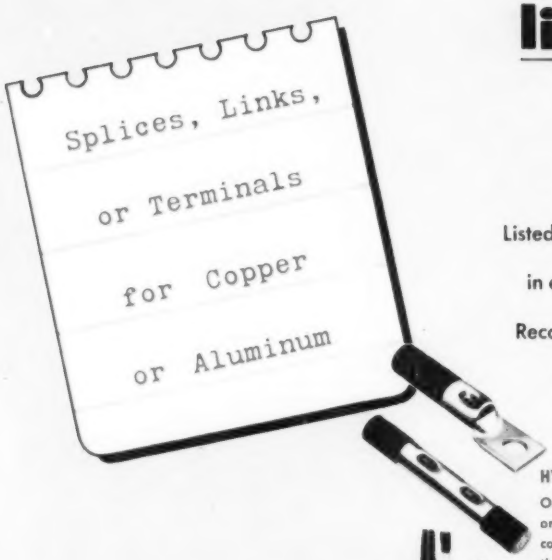
CALL GRAYBAR FIRST FOR . . . GRAYBAR Everything Electrical

hydraulic power for quick, economical connections anywhere

FOOT OPERATED HYPRESS*

BURNDY

lightest tools



HYDENT CONNECTORS...

Listed by Underwriters' Laboratories in all sizes — #22 through 2,000 Mcm.

Recommended for hydraulic tooling from #9 through 2,000 Mcm.

HYLUGS and HYLINKS

One piece, pure copper, tubular construction. Indent on any side of barrel. Can't split. No intermediate contact surfaces, current carried by entire cross-section. Plated to resist corrosion. Ask for Catalog Y53B.

HYCRAB

Insulated multiple connector. Most economical method of joining cables in underground networks. Ask for Catalog Z47B.

*Air or electrical driven units can replace foot pump where required

electrical connectors and installation tools by...

CALL GRAYBAR FIRST FOR...

GRAYBAR Everything Electrical

HYPRESS

per ton of delivered force

HYDENT INSTALLATION...

A time saving, money saving method of making permanent, uniform connections faster. Made feasible for general use when Burndy developed portable hydraulic installation tooling 15 years ago. Better connections assured by intimate, high pressure contact between connector and conductor. Quickly interchangeable dies permit each tool to be used over wide range of conductor sizes.

MANUAL HYPRESS

CONSTRUCTION WIRING

Cost comparison was made recently on a construction job involving 160 connections for wire of average size. The savings on Hydent connectors (against cast connectors) more than paid for the Hypress. On future jobs this contractor will save over 80% of his former connector cost. Even against the most economical type of bolted connector, savings would average 40%-50%.

MODERN TOOLING

"A 9-lb. tool with a 9-ton bite" makes the manual Hypress a favorite everywhere. Rotating head through 90°. Neoprene insulated as a protection against short circuits.

For maneuverability in cramped quarters—for indenting pressures to 80,000 lbs. and for wire or cable through 2,000 Mcm—the foot operated Hypress is predominant. Swivel jointed flexible high pressure hose permits use at any angle.

52-13

BURNDY ENGINEERING COMPANY

NORWALK, CONNECTICUT • BURNDY CANADA, LTD., Toronto 8, Ontario

CALL GRAYBAR FIRST FOR...

GRAYBAR Everything Electrical

Mr. William Hartfel, Chief Electrician
Trent Tube Mfg. Co., East Troy, Wisconsin
Division of Crucible Steel Co. of America

"By replacing ordinary fuses with Fusetron fuses

WE WIPED OUT NEEDLESS FUSE BLOWS

"We have a 1200 ampere switch with a grounded neutral on our 220 volt, 3 phase system. To handle the load of approximately 1000 amperes, we used two 600 ampere fuses in parallel.

"These fuses gave us a lot of trouble by blowing two or three times a week. Each blow meant a shutdown that caused a loss in production.

"In the early part of May, about two months ago, we decided to try out Fusetron dual-element fuses.

"These fuses completely wiped out needless fuse blows and what is more important they eliminated the costly interruptions of operating schedules."

Don't Risk Losses in Your Plant

One **needless** shutdown — One **lost** motor

One **destroyed** panel or switch

One **burned out** solenoid

May cost you more than replacing every ordinary fuse with a FUSETRON dual-element Fuse.

But, simply knowing that FUSETRON fuses do save money is knowledge — but it isn't action.

By passing the word along that all purchase and stock records should call for FUSETRON dual-element fuses, you have action that begets money saving.

CALL GRAYBAR FIRST FOR . . . Everything Electrical

IN A 1200 Amp. SWITCH

and stopped production shutdowns that had been occurring two or three times a week."

Fusetron DUAL ELEMENT Fuses

Provide NOT ONLY SHORT CIRCUIT *But* 10 Point Protection

1. Protect against short-circuits.*
2. Protect against needless blows caused by harmless overloads.
3. Protect against needless blows caused by excessive heating—lesser resistance results in much cooler operation.
4. Provide thermal protection — for panels and switches against damage from heating due to poor contact.
5. Protect motors against burnout from overloading.
6. Protect motors against burnout due to single phasing.
7. Give DOUBLE burnout protection to large motors — without extra cost.
8. Make protection of small motors simple and inexpensive.
9. Protect against waste of space and money — permit use of proper size switches and panels.
10. Protect coils, transformers and solenoids against burnout.

FUSETRON
TRUSTWORTHY NAMES IN ELECTRICAL PROTECTION
BUSS

*Fusetron fuses have high interrupting capacity as shown by tests of the Electrical Testing Laboratories of New York City in December 1947.

Send the Coupon for more facts

Bussmann Mfg. Co., University at Jefferson, St. Louis 7, Mo. (Division of McGraw Electric Co.)
Please send me complete facts about FUSETRON dual-element Fuses.

Name _____ Title _____
Company _____
Address _____
City & Zone _____ State _____ ECM 4-52

(Fusetron is a trade mark of the Bussmann Mfg. Co., Division of McGraw Electric Co.)

CALL GRAYBAR FIRST FOR . . .

GRAYBAR Everything Electrical

users prefer COFFING HOISTS

. . . for multiplying manpower

Wherever a load must be lifted, pulled, skidded, stretched, moved, or bound, there is a right Coffing Hoist to take over the heavy work, speed the job, and in many cases, enable one man to replace a crew.

. . . increased safety

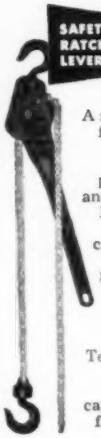
You can depend on Coffing Hoists to protect men and equipment. Each is designed and built to operate efficiently at full rated capacity with a wide margin of safety.

. . . saved maintenance costs

Coffing Hoists stay on the job longer because they require less maintenance attention. Prompt Coffing service and immediate shipment of replacement parts further reduces delays and down time. Down-time costs saved and repair costs saved are profits earned.

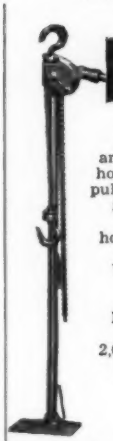
QUIK-LIFT ELECTRIC HOISTS

Ruggedly built for the most continuous assembly line use. For long life, all moving parts are sealed, running in oil. For safety, parts are tested at 100% overload. Seventeen models — 500 to 4000-lb. capacities.



SAFETY-PULL RATCHET LEVER HOISTS

A safe, sure lift for any load. Multiplies manpower, protects men and equipment. Dual ratchet and pawl cannot slip or drop load. Safety valve handle eliminates overload dangers. Ten models — 1,500 to 30,000-lb. capacities . . . factory-tested at 100% overload.



HOIST-ALL

A handy all-around tool for hoisting, lifting, pulling. Without its stand, it is an efficient hoist, puller, or load binder. With stand, it becomes a powerful high-lift jack. Two sizes — 2,000 and 4,000-lb. capacities.

SAFETY LOAD BINDERS

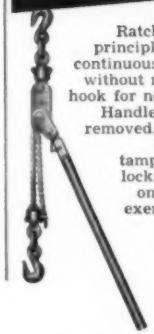
Powerful, highly portable, safe. Dual ratchet and pawl hold securely. Handle cannot fly up when released for another "bite." Two models — 3,000, and 6,000-lb. capacities.

CHALLENGER SPUR GEAR HOISTS

All steel, yet weighs only 39½ lb. Formed steel housing resists impact . . . does not crack under shock loads. Back plate is laminated for greater rigidity. Load may be adjusted up or down a fraction of an inch. Hoist hangs true even without load. May be completely disassembled in minutes with ordinary tools. Factory-tested at 100% overload . . . has five-to-one safety factor. Two models — ½- and 1-ton capacities.

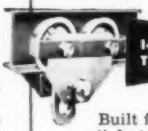
MIGHTY-MIDGET PULLERS

Big pulling power in a small package. Light, compact, a Mighty-Midget hangs easily on a tool belt. Handle can be used either as a lever or a high-speed crank. Two sizes — 500-lb. model weighs only 6½ lb., 1,000-lb. model weighs only 9½ lb.



HOIST-BINDER

Ratchet hoist principle allows continuous take-up without releasing hook for new grab. Handle may be removed, making binder a tamper-proof lock. Weighs only 10 lb., exerts 3,000-lb. pull.



I-BEAM TROLLEYS

Built for years of satisfactory service. Plain or geared types. Capacities up to 10 tons.

COFFING HOIST COMPANY

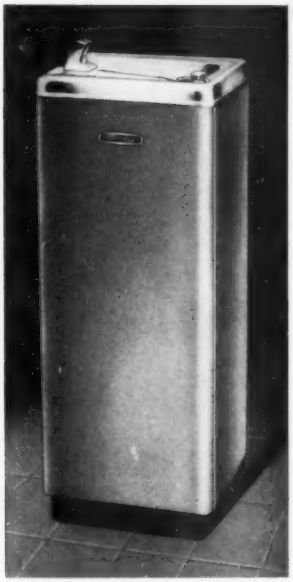
Danville, Illinois

CALL GRAYBAR FIRST FOR . . .

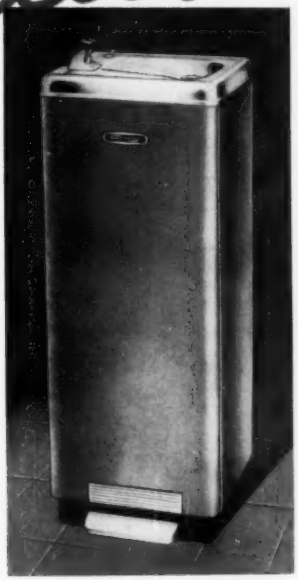
GRAYBAR Everything Electrical

Cordley

Electric DRINKING WATER COOLERS



MODELS WITH HAND CONTROL
H-4, H-6, H-10, H-10W



MODELS WITH FOOT PEDAL
F-6, F-10, F-10W, F-10WE

MODEL M-20
Also supplied with Foot Pedal

HERMETIC MODELS AND GENERAL INFORMATION

MODEL	*STANDARD RATING G.P.H.	TYPE CONTROL HAND	TYPE CONTROL FOOT	H.P.	COM-PRESSOR	CONDENSER	NET WT.	SHPG. WT.
H-4	4.0	X		1/9	Hermetic	Air-Cooled	98	124
HJ-6	6.0	X		1/9	Hermetic	Air-Cooled	90	116
H-6	6.0	X		1/9	Hermetic	Air-Cooled	100	126
F-6	6.0		X	1/9	Hermetic	Air-Cooled	100	126
H-10	9.5	X		1/6	Hermetic	Air-Cooled	125	151
F-10	9.5		X	1/6	Hermetic	Air-Cooled	125	151
H-10W	11.2	X		1/6	Hermetic	Water-Cooled	121	147
F-10W	11.2		X	1/6	Hermetic	Water-Cooled	121	147
F-10WE	10.3		X	1/8	Hermetic	Water-Cooled	129	155
M-20	20.2	X		1/3	Hermetic	Air-Cooled	170	195

*At 90° room temp., 80° inlet water, 50° drinking water. Hand control may be added to foot pedal models. Kit available

Cordley does only one thing, and does it better . . . makes better water coolers. Its international reputation is staked on the performance of its coolers, and its coolers alone. That's why you can rely upon Cordley.

Write for new 24 page catalog which describes 17 Cordley Models, and tells where and how to use them.

5-YEAR WARRANTY

Every user of Cordley Hermetic Electric Water Coolers is protected for a period of five years from the date of installation. This warranty covers replacement of the entire cooler if a defect occurs within the hermetic factory-sealed refrigerant system. Copy of the complete warranty will be supplied upon request.

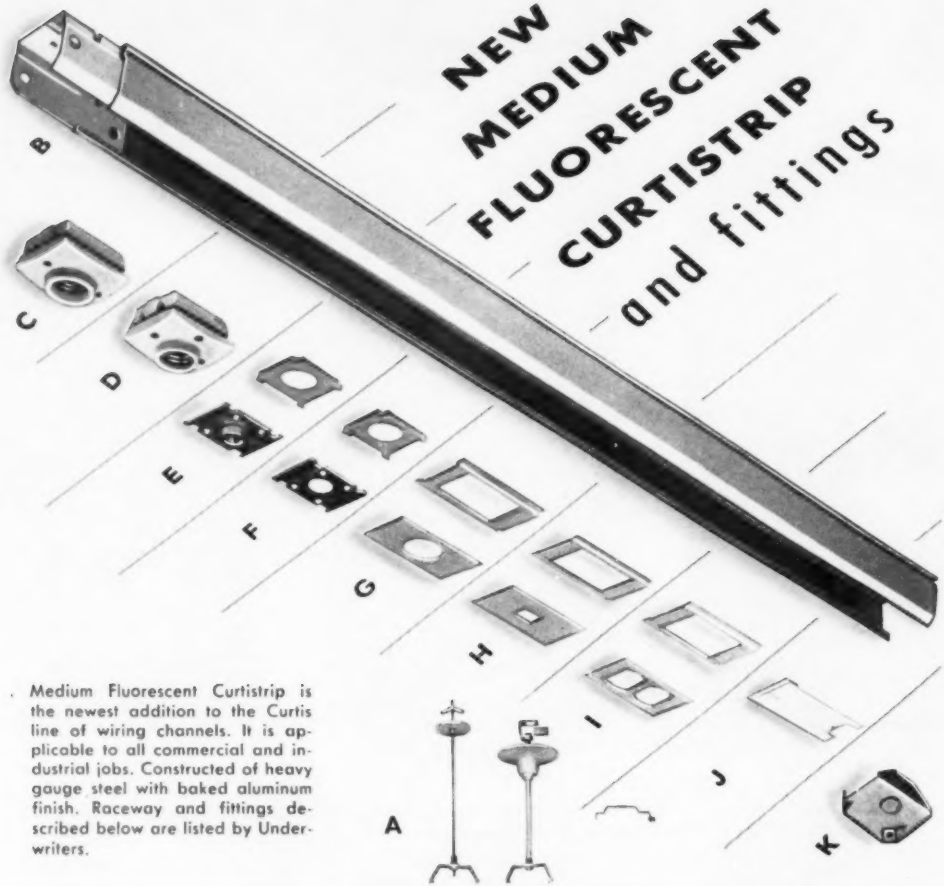
PLUS THIS UNIQUE WARRANTY WITH 4-WAY PROTECTION

SINCE 1889 . . . CORDLEY KNOWS HOW . . . OVER 1,000,000 SOLD

CALL GRAYBAR FIRST FOR . . .

Graybar Everything Electrical

NEW MEDIUM FLUORESCENT CURTISTRIP and fittings



Medium Fluorescent Curtistrip is the newest addition to the Curtis line of wiring channels. It is applicable to all commercial and industrial jobs. Constructed of heavy gauge steel with baked aluminum finish. Raceway and fittings described below are listed by Underwriters.

COMPLETE WIRED UNITS

Medium Fluorescent Curtistrip wired units furnished in 8 ft. sections with 2-lamp ballasts and 4 ft. sections with single lamp ballast. Available with closed or open-end Alzak Aluminum or baked white "Fluracite" enamel reflectors. Shallow Reflector for general lighting, local or indirect lighting. Asymmetric Reflector for sloping surface, show windows or cove lighting applications. Deep Reflectors for semi-concentrating lighting or direct lighting over counters, benches, cases, etc.

FITTINGS

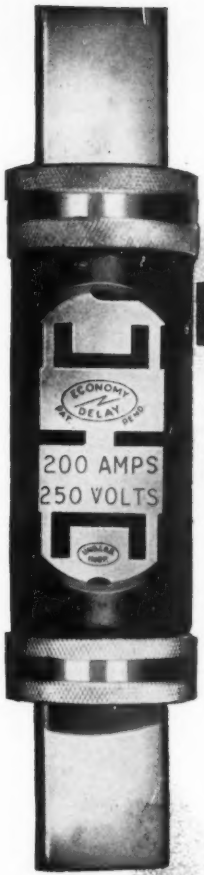
A	Versatile tong and clamp type hangers.
B	Coupling for connecting two pieces of Curtistrip.
C	Porcelain socket with shade holder groove.
D	Porcelain socket, no shade holder groove.
E	Female nipple attachment for supporting reflectors.
F	Plate to connect BX to Curtistrip.
G	Single plate for all standard receptacles.
H	Switch plate for standard toggle switch.
I	Duplex plate for all standard receptacles.
J	Fluorescent lampholder plate.
K	End cap with knockout.

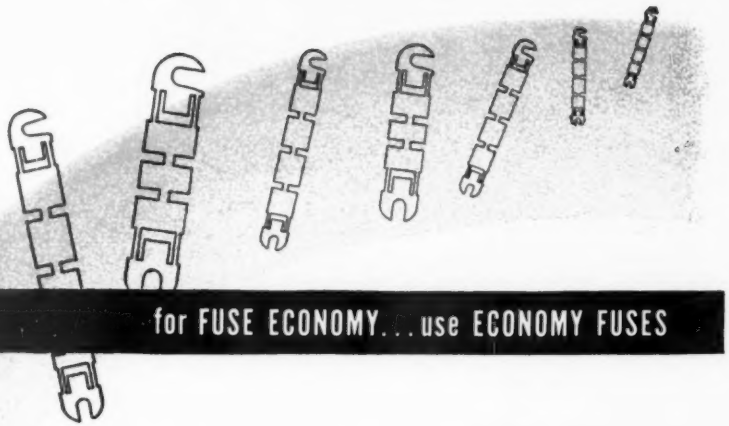
CURTIS LIGHTING, INC.

Write Dept. D12-05 for free details on this new Medium Curtistrip and the Small and Mogul sizes.

Dept. D12-05, 6135 West 65th Street, Chicago 38, Illinois

CALL GRAYBAR FIRST FOR . . . Everything Electrical





for FUSE ECONOMY... use ECONOMY FUSES

SUREST protection at LOWEST cost

...and CONSERVES *precious Brass and Copper*

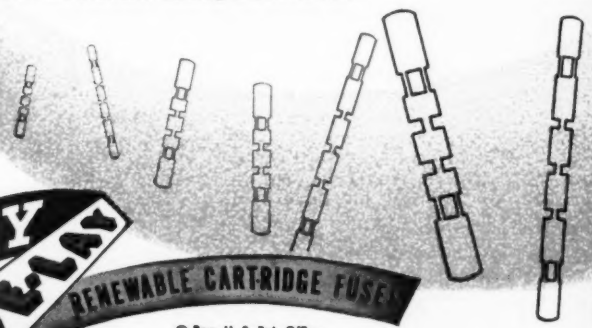
Your first investment in a metal-conserving "ECONOMY DE-LAY" Renewable Fuse is reasonable—and you save a lot of money every time you have a "blow". Because you simply remove the blown link and replace it with a new, inexpensive "ECONOMY DE-LAY" Renewal Link in the same cartridge.

This restores the fuse to its original efficiency, at a cost of only a few cents for each "blow".

You can't buy any other type of fuse protection that "serves" you so well, and costs so little.

Your Electrical Wholesaler has "ECONOMY DE-LAY" Renewable Fuses and Renewal Links in stock.

Ask for the ECONOMY Catalog and Price List.



ECONOMY DELAY RENEWABLE CARTRIDGE FUSES

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ECONOMY FUSE AND MFG. CO., 2717 GREENVIEW AVE., CHICAGO 14, ILLINOIS REPRESENTATIVES IN ALL PRINCIPAL CITIES

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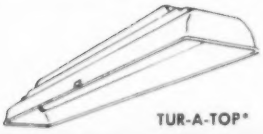
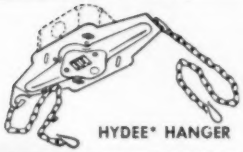
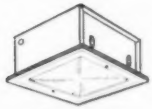
Everything Electrical

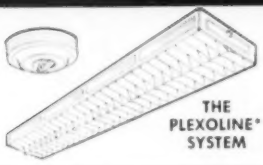

TUR-A-TOP*

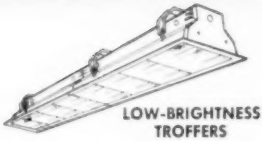
DAY-LINE*

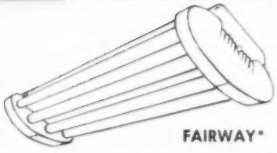

HYDEE* HANGER

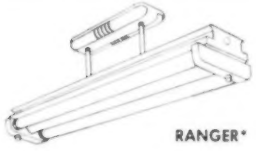
There's a DAY-BRITE Fixture for Every Lighting Need

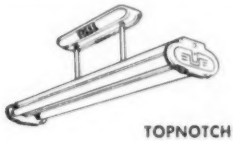

DUO-FRAME

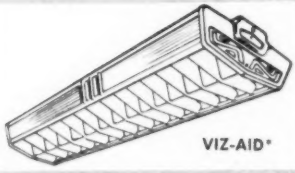

THE PLEXOLINE* SYSTEM


LOW-BRIGHTNESS TROFFERS


FAIRWAY*


RANGER*


TOPNOTCH*


VIZ-AID*

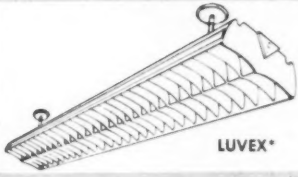
In factory, store, school, office or hospital, Day-Brite does a better lighting job for you and your customer

Whether you're writing specifications for a big, new factory or re-lighting an old one . . . lighting a super-market or just the corner drugstore . . . you'll find a Day-Brite fixture to meet your requirements. Day-Brite offers the best, most complete line of lighting fixtures available anywhere.

And look what you get! Every unit in the famous Day-Brite line is built to last . . . with die-formed, heavy-gauge steel construction. Every unit features ETL Certified ballasts. All fluorescent fixtures are equipped with no-blink type starters. And all industrial fixtures are available with apertures for an upward component of light.

These plus other Day-Brite advantages—the ease of installation and maintenance that saves so much time and money—are some of the reasons why so many lighting contractors insist on Day-Brite. See what Day-Brite can do for you. Write for your copy of the Day-Brite catalog TODAY!

*®


LUVEX*

EXIT SIGNS

"DECIDEDLY BETTER"
DAY-BRITE®
Lighting Fixtures

228

DAY-BRITE LIGHTING, INC., 5402 BULWER AVENUE, ST. LOUIS 7, MO.

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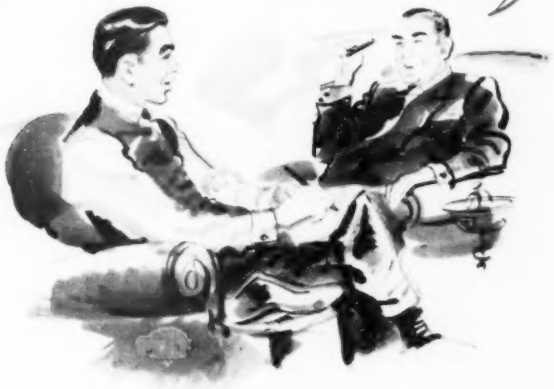
Graybar Everything Electrical

"I'm sold on Edwards and their way of doing business"

"Their equipment's tops, too. You don't need a trapeze artist to install it!"



Fact! Today more and more contractors and distributors prefer Edwards. And for excellent reasons. They like:

Edwards *Dependability:* For over 80 years Edwards has pioneered in the design and development of precision-built Electrical Signaling, Communication and Protection equipment for Schools, Hospitals, Industry, Offices and Homes.

Edwards *Cooperation:* All Edwards equipment is designed with the contractor in mind . . . to install easily, economically . . . save him maintenance, man-hours, overhead . . . deliver a bigger profit on every job.

Edwards *Protection:* All Edwards business goes through the distributor who services the contractor in the sale of Edwards staples. The distributor also profits from the system business developed by Edwards. *Double* reward!

Edwards *National Advertising:* Month after month Edwards advertising in leading national magazines reaches important prospects in major markets . . . builds business and profits for distributors and contractors not only for systems but Edwards staples as well.

It pays to work with Edwards.

EDWARDS®

World's Most Reliable Time, Communication and Protection Products For Schools, Hospitals, Industry and Homes.

Time is Money to Contractors

Edwards equipment is designed to save the contractor valuable man hours . . . give him a bigger profit on every job. Here are a few examples:

- **The new Edwards Fire Alarm Station can be mounted without balancing or juggling . . . wires connect to terminals from the front.**
- **The mounting plates of the Adaptabel and Adaptahorn can be fastened to any standard backbox.**
- **Edwards Easi-Mount Transformer can be installed through knockouts in standard backboxes by tightening the screw on the outside of the box.**
- **Program Instrument Backboxes can be mounted before plastering.**
- **Edwards Audio-Visual Hospital Equipment fits standard gang face plates and backboxes. Telephone jacks, outlet receptacles also can be mounted and ganged together.**

These are a few of the many Edwards advantages that spell maximum ease of installation, rugged, trouble-free operation with minimum servicing and maintenance. Time means money to contractors. Save it with Edwards.

For further information, write Dept. E-4, Edwards Company, Inc., Norwalk, Conn.

CALL GRAYBAR FIRST FOR . . .

Graybar Everything Electrical

Efficiency

SUSPENSION DEVICES
ARE TIME AND COST SAVERS

By eliminating the need for punching, drilling or burning through beams in order to hang electrical mountings . . . Efficiency Suspension Devices can save you time and expense on practically every construction job. They are ideal for attaching wires, cables, conduits and pipes to most construction forms and surfaces, including structural steel, concrete, brick, hollow tile and wood.

Simple in design and correctly engineered for their service, these devices have been service-proved countless times. Illustrated here are only a few Efficiency Suspension Devices. Complete details are included in the efficiency catalog—gladly sent on request.

BUSHING SUPPORTS

Designed to eliminate the drilling of holes for mounting, these supports are adjustable to any angle. Made of malleable iron with highest quality split porcelain, they are furnished for AC-DC service to handle 3/16" to 2½" cable. Type G is clamp-mounted, while Type VB and VG bolt mounted through its circular base.

BRUSHING RACKS AND SUPPORTS

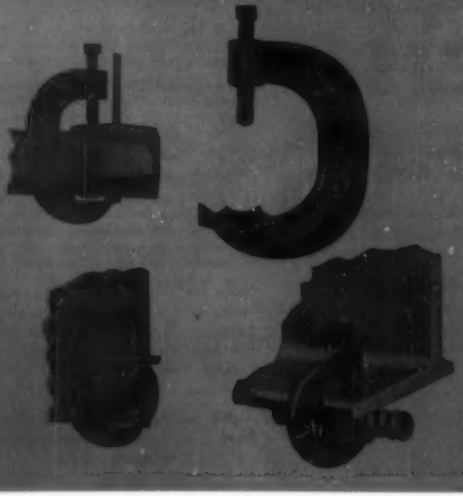
Available in 1, 3, 4, 5 and 6 bushing racks for AC or DC service. Only a single bolt is required to support the bushing and clamp the support to the rack. For 3/16" to 2½" wire sizes.

NESTED BUSHING RACKS AND SUPPORTS

Simply and compactly designed to carry conductors equidistant from center to center. Each bushing is a separate unit, allowing independent installation of each cable line. Available in 2, 3, 4, 5 and 6 bushing racks.

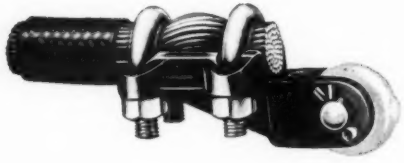
CONDUIT HANGERS

Correctly designed for carrying armored cable or ½" to 2½" pipe along open steel construction. Radiating ridges and the five point gripping surface keeps the pipe suspended dead center, with the set screw above permitting the cable or pipe to be carried at any angle. Made of highest quality malleable iron.



CABLE STRAIN CLAMP

Capable of withstanding a direct pull of over 12,500 lbs. before slipping, this clamp can be furnished either with eye or clevis. Three clamp sizes accommodate all cable sizes from 1/0 to 1,500,000 c.m. Constructed of malleable iron, this clamp has a high ridge across the center of the cable channel and a U-bolt at each end.



Efficiency
ELECTRIC AND MANUFACTURING COMPANY

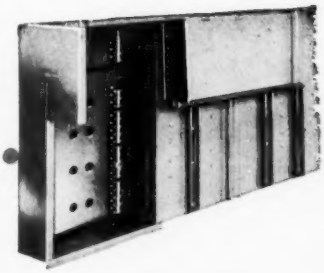
East Palestine, Ohio

CALL GRAYBAR FIRST FOR . . .

Graybar Everything Electrical

ELECTRIC FEEDRAIL®

"Nerves" for a 30-ft. giant



Partial view of 79 pole, multiple conductor Feedrail trolley busway system that distributes current for power and control of this 30-ft. giant mill. Except for critical hand lever adjustments, all control is through buttons and selector switches located in remote dual console stations.

This huge thirty foot vertical boring and turning mill was built by the Niles Tool Works Div., Baldwin-Lima-Hamilton for Allis-Chalmers Mfg. Co.

Giant thirty foot boring mills are not built every day. When they are, precision control is essential. A 79 pole multiple conductor Feedrail provides the "nerve system" for finger-tip control and dependable, unfailing power supply for this massive machine.

Every day Feedrail is solving power and control problems. Moving trolley outlets in an enclosed track roll with electric tools which must follow work. Power machines move in and out of work centers quickly, and produce more work in less time. Feedrail flexibility is engineered into standardized units that assemble to give a "tailored to fit" power supply system. Write for literature.

Sold by leading electrical distributors.

46-C

ELECTRIC FEEDRAIL®

Never Becomes Obsolete

FEEDRAIL CORPORATION

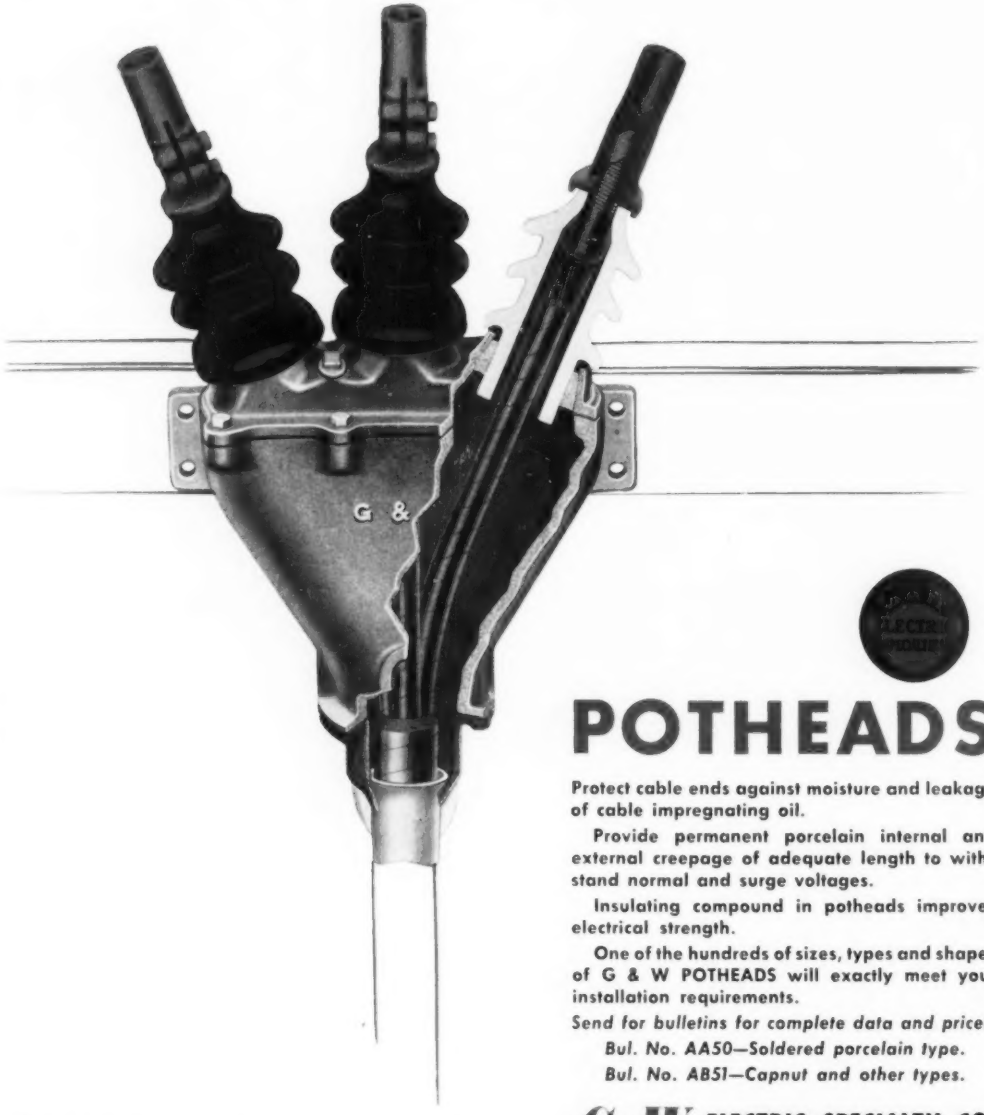
Subsidiary of Russell & Stoll Company, Inc.

125 BARCLAY STREET · NEW YORK 7, N. Y.

CALL GRAYBAR FIRST FOR . . .

Graybar Everything Electrical

PROPER SEALING AND TERMINATING OF HIGH VOLTAGE CABLES IS IMPORTANT. IT PAYS TO USE G & W POTHEADS... THE STANDARD OF THE INDUSTRY SINCE 1905.



POTHEADS

Protect cable ends against moisture and leakage of cable impregnating oil.

Provide permanent porcelain internal and external creepage of adequate length to withstand normal and surge voltages.

Insulating compound in potheads improves electrical strength.

One of the hundreds of sizes, types and shapes of G & W POTHEADS will exactly meet your installation requirements.

Send for bulletins for complete data and prices:

Bul. No. AA50—Soldered porcelain type.

Bul. No. AB51—Capnut and other types.

G & W "Forethought" A52 explains the theory of Stress Relief Cones as used in potheads. Send for your copy, there is no obligation.

G & W ELECTRIC SPECIALTY CO.
7780 Dante Avenue, Chicago 19, Ill.
Cable Terminating, Connecting and Sectionalizing Devices
Representatives in principal cities of U. S. A.
In Canada—Powerlite Devices Ltd. Toronto and Montreal

CALL GRAYBAR FIRST FOR... Everything Electrical

available!

Through increased facilities we are maintaining prompt schedules on most GARCY lighting products. GARCY'S stocking distributors have them on hand now.

5050
2 lamp
VISUALIER SERIES

4 FT. Fluorescent or Slimline

8 FT. Slimline

5054
4 lamp
VISUALIER SERIES

4 FT. Fluorescent or Slimline

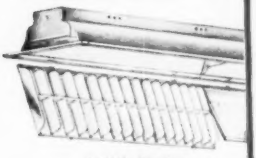
8 FT. Slimline

GARCY
"Thin Panel"
LUMINAIRES
WITH METAL SIDES

2 lamp or 4 lamp; 4 ft. or 8 ft.; fluorescent or slimline; closed or open top; Spot-a-Lite units to match.

GARCY
"Thin Panel"
LUMINAIRES
DIFFUSING SIDE PANELS

2 lamp or 4 lamp; 4 ft. or 8 ft.; fluorescent or slimline; closed or open top.



5500 Series
TROFFERS

1, 2 or 3 lamp rows; louver, lens, diffusing glass or open bottom; 4, 6 or 8 ft. lengths; fluorescent or slimline — also Spot-a-Lites to match.

2696 Series
SLIMLINE LUMINAIRES

Lamps exposed or louver shielded, 4 or 6 lamp rows, 4, 6 or 8 ft. units—also Spot-a-Lites to match. Ideal for stores.

Two-Row Series
EXPOSED LAMP FIXTURES

No. 8808—two lamp, fluorescent or slimline, 4, 6 or 8 ft. May be coupled in continuous runs. Also available louvered (No. 8810HL) and baffled (No. 8818).

9674 Series
combines
FLUORESCENT
and
INCANDESCENT
light

Designed to save you

TIME-LABOR-COST!

NEW GARCY

ADJUSTABLE stem hangers

Easy Hook-on Attachment

Stem hooks on to hickey. No nuts or bolts. Stems are attached to fixtures down on the floor *before hanging*

Canopy covers standard outlet box whether concealed recessed or surface mounted.

Easily Adjusted

A few turns of the stem lengthen or shorten it to compensate for uneven ceiling conditions.

Many hanger systems used and recommended.

GARDEN CITY

PLATING & MANUFACTURING CO.

1740 N. ASHLAND AVE. • CHICAGO 22, ILL.

No. 16772-L

INCANDESCENT UNITS

Wide Variety Available

6970 series

GARCY
Adda-Strip

A complete line for every strip lighting application. Lengths from 18" to 96" for practically every fluorescent or slimline lamp. Also easy-to-attach reflector strips for directional light control.

CALL GRAYBAR FIRST FOR . . .

Graybar Everything Electrical

You should expect the best value from G-E fluorescent lamps

WATER TOO PURE TO DRINK HELPS GIVE YOUR CUSTOMERS MORE LIGHT. It's the water on the *right* you wouldn't want to drink. It's so pure it's tasteless. You'd prefer the water on the left. Ordinary tap water, it's safe enough for drinking. But not for G-E fluorescent lamps. A chemical reagent shows mineral impurities. If they got into the phosphor coating, they would cut light output. On the glass tube, they would create a streaked look. So General Electric uses the specially ultra-deionized water shown at right in making our phosphors and to wash our lamp tubes. It's twice as free of minerals as distilled water. A small precaution — perhaps. But it helps give your customers more light and better looking lamps. It's another reason why you and your customers *should* expect the best value from G-E fluorescent lamps.

You can put your confidence in

GENERAL ELECTRIC

CALL GRAYBAR FIRST FOR . . . Everything Electrical

MUTUAL ENDORSEMENT

IN PROCUREMENT... Two fundamentals apply, always. 1. Pick yourself a reliable source of supply. 2. Specify a definite manufacturer's product, for quality's sake...This page displays two names to which you can pin your faith, under all circumstances. Everything you need is there—modern-specification insulation; quality-guaranteed construction; intelligent, cooperative service.

- BARE WIRES AND CABLES
- OK*—PEERLESS*—TIP-TOP* WEATHERPROOF WIRES
- GUARDIAN* BUILDING WIRES AND CABLES—THERMOPLASTIC AND RUBBER INSULATED
- ROMEX* AND ROMEX-T. NON-METALLIC SHEATHED CABLES
- VARNISHED CAMBRIC POWER AND CONTROL CABLES, THERMOPLASTIC AND THERMOSETTING JACKETED, BRAIDED, OR LEAD SHEATHED
- SUPER SERVICE S* AND OTHER PORTABLE CORDS AND CABLES
- SERVICE CABLES—ALL TYPES

*TRADE MARK REG. U. S. PAT. OFF.

GENERAL CABLE
CORPORATION

OFFICES IN PRINCIPAL CITIES

CALL GRAYBAR FIRST FOR... Everything Electrical

MADE FOR USE TOGETHER, G-E control and Tri-Clad motors give reliable service in every industrial application.

G-E Motors and Control Give Longer Service, Need Less Upkeep

PROMPT DELIVERY! Many models of G-E control and Tri-Clad motors are available from stock. Especially important now, you get quick, efficient service too!

Used together, G-E motors and control reduce expenses, guard against production breaks.

In every G-E Tri-Clad* motor, for example, you get *built-in* extra protection against electrical breakdown: one-piece cast-aluminum rotor, Formex* wire windings, double-end ventilation.

Rigid, cast-iron structure resists heavy blows, dripping liquids, corrosive fumes. And you can relubricate a Tri-Clad motor when the application requires it—without halting production!

Big new features in G-E motor starters give extra long life and cut maintenance costs too. Plastic block keeps windings permanently protected. Fine silver tips outlast ordinary contacts, stand up on toughest "start-stop" jobs.

Moving structure is rugged and simple. No metal-to-metal friction between magnet and coil. Reliable overload relays need little attention. Heaters are up front—easily changed without disturbing wiring.

Call or write today for more information.

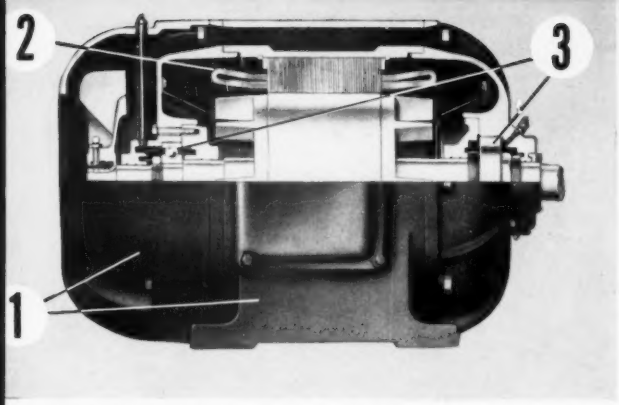
GENERAL ELECTRIC

674-106

*Registered trade-marks of General Electric Co.

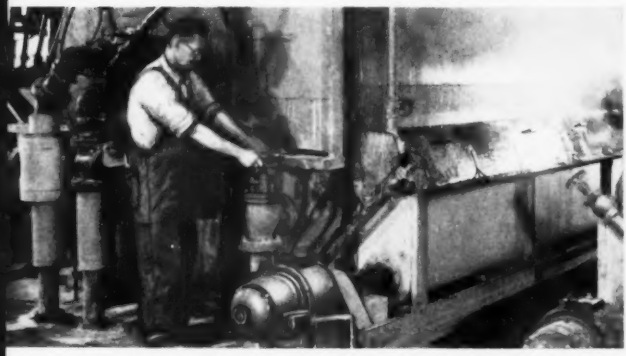
CALL GRAYBAR FIRST FOR . . .

Graybar Everything Electrical

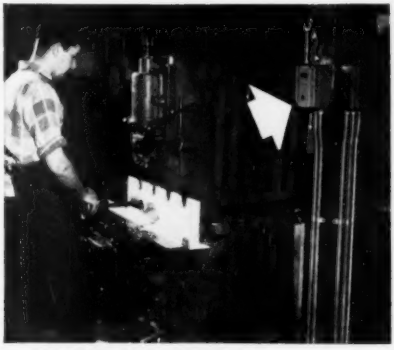


LONGER LIFE is assured by (1) rigid, cast-iron end shields and frame; (2) Formex wire windings; (3) completely enclosed bearings with provision for relubrication without disassembly.

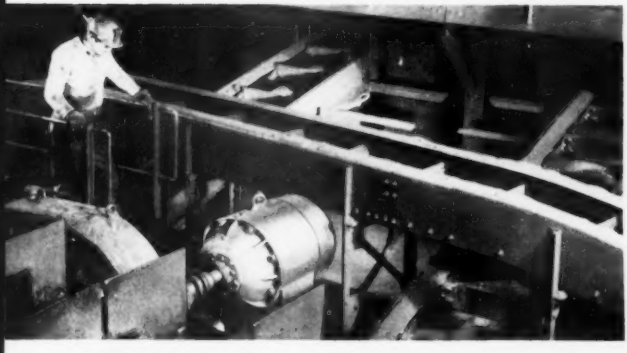
ACCESSIBLE TERMINALS make electrical connections fast, easy. Panhead screws and saddle-type connectors give rigid connections.



NO COSTLY SHUTDOWNS on this food-plant "continuous process" operation! Totally enclosed, non-ventilated, Tri-Clad gear-motor provides reliable drive for this repulper in large sugar refinery.



PRODUCTION PROTECTION is afforded by G-E motor starter on this mortiser by helping prevent time-consuming, costly shutdowns.



CORROSION-RESISTANT Tri-Clad motors can take abuse, won't twist out of line. Totally enclosed, fan-cooled, Tri-Clad motor above has given long, continuous service on a coal conveyor.

CONSTANT USE in stop-and-go operations on this 15-hp rip saw proves ruggedness of the sturdy, G-E magnetic motor starter.

CALL GRAYBAR FIRST FOR . . .

Graybar Everything Electrical

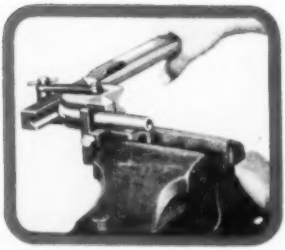
Speed, simplify

electrical construction jobs...cut costs...

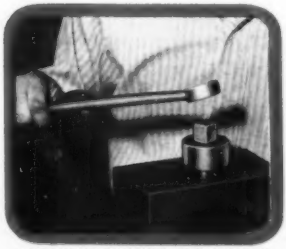
with GREENLEE timesaving tools for electrical work

GREENLEE HYDRAULIC CONDUIT BENDER

Conduit installations go far faster . . . neat, tailor-made jobs result every time with a GREENLEE Bender. Many owners report labor savings from 50% to 90% . . . and the cost of many manufactured bends and fittings is eliminated. For, with the GREENLEE *one man* in but minutes makes smooth, accurate bends in pipe up to 5", rigid and thin-wall conduit, tubing and bus bars. Compact and portable, the GREENLEE Hydraulic Bender can be easily and quickly moved for *on-the-job bending* exactly where and when wanted! Users say it often pays for itself on the very first job. Get facts today.



HAND BENDERS FOR TUBING
For quickly making small-radius bends, up to 180°, without flattening or kinks. Saves up to 75% in time and materials on many jobs. Various models and sizes to fit your work.



KNOCKOUT PUNCHES AND CUTTERS
Here's the quick, easy way to make knockout enlargements for ½" to 4" conduit. Simply insert GREENLEE Knockout Punch in knockout or small drilled hole, then turn with an ordinary wrench.

GREENLEE KNOCKOUT PUNCH DRIVER
This powerful portable hydraulic tool drives GREENLEE Knockout Punches through 10-gauge metal in a jiffy. Drives all sizes of GREENLEE punches to make openings for ½" to 4" conduit.

SEE YOUR ELECTRICAL DISTRIBUTOR...

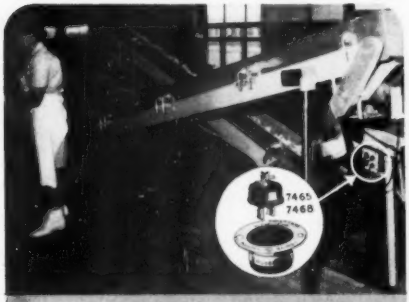
. . . get complete information on the above and other GREENLEE timesaving tools: Hydraulic Pipe Pushers • Cable Pullers • Joist Borers • Electricians' Auger Bits • Bell Hangers' Drills • Bit Extensions • Expansive Bits • Spiral Screw Drivers • Automatic Push Drills • and many more. Greenlee Tool Co., 1744 Columbia Avenue, Rockford, Illinois.

CALL GRAYBAR FIRST FOR . . . Everything Electrical

modernize...

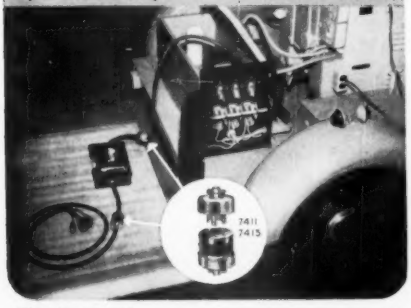
with HUBBELL Twist-Lock DEVICES

Twist-Lock devices eliminate time losses and annoying delays because they "Stay Put"... are vibration proof... assure a lockfast electrical connection under all conditions.



1. Midget Twist-Lock devices numbers 7465-7468 used with Potato Chip Sacking Machines, Codie-Kay Company.

2. Power take off from portable generator set, demonstration unit of Contour Saws, Incorporated, illustrating 20 Ampere Cap, #7411 cap used with #7413, 20 Ampere connector body



Twist-Lock devices are engineered and designed to meet a wide variety of conditions and requirements in industrial use.

- STRONGER
- LONGER LIFE

"A TWIST OF THE CAP AND IT LOCKS"

AS EASY AS **1-2-3**

1. Plug in 2. Twist 3. They're locked

Twist-Locks are manufactured in complete lines of two, three, and four wire electrical locking devices, in ratings from 10 Amperes to 50 Amperes.

They never disconnect accidentally!

HARVEY HUBBELL, Inc.

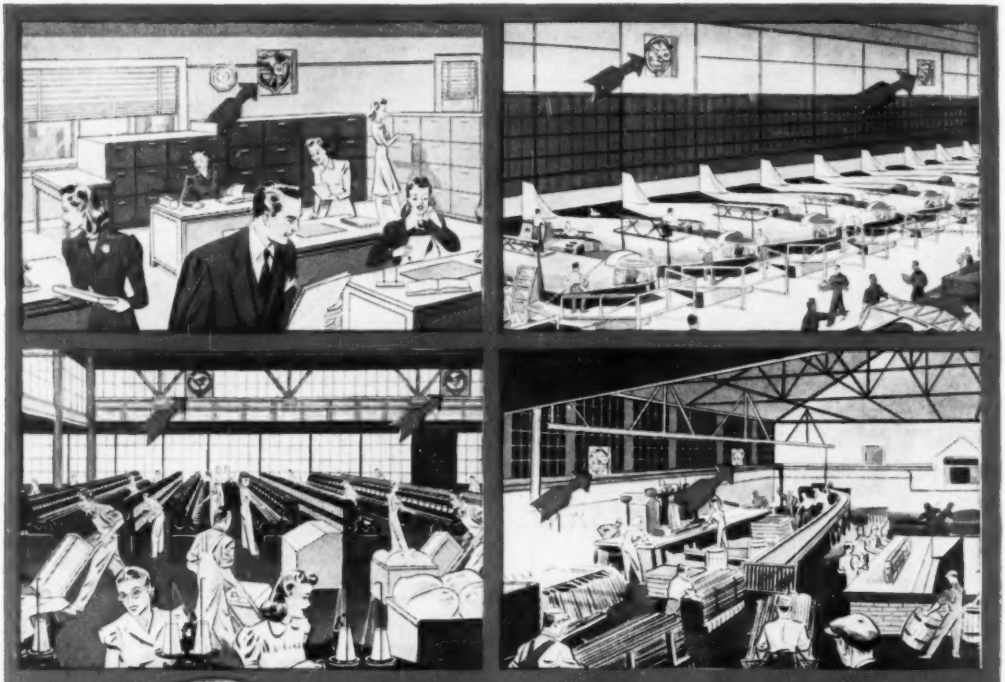
BRIDGEPORT, CONN.

HUBBELL
THE ORIGINATOR OF
THE LOCKING WIRING DEVICE*

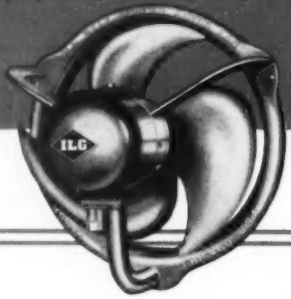
*For best results specify Hubbell Twist-Lock, a complete line of LOCKING WIRING DEVICES.

CALL GRAYBAR FIRST FOR...

GRAYBAR Everything Electrical



Fresh Air for Defense!



Quiet . . . Powerful . . .

ILG Self-Cooled Motor Propeller Fans

Specifically engineered for exhaust duty. Has famous Self-Cooled Motor . . . patented "Q" type fan blades . . . rugged, streamlined frame . . . direct-connection of motor and fan . . . electrically balanced rotating parts . . . backed by ILG's "One-Name-Plate" Guarantee. Over a million in use!

AS you construct new buildings, or revamp departments—as you increase your staff, work longer hours or move shifts—pay attention to your ventilation! With a modern fresh air system you can reduce fatigue, minimize errors, keep workers more cheerful and contented. You can provide an invigorating atmosphere . . . drive out stale air, excess heat, smoke, steam, fumes. We stand ready to help you lay out an efficient system, recommend the proper equipment, and make deliveries on time! Phone our nearby Branch Office (consult classified directory) or write today.

ILG
REG U S PAT OFF

VENTILATION

ILG ELECTRIC VENTILATING CO., 2879 North Crawford Avenue, Chicago 41, Illinois

Offices in more than 50 Principal Cities

CALL GRAYBAR FIRST FOR . . .

Graybar Everything Electrical

Spliced for Life!

IDEAL Wire-Nuts®

Patented, No. 1,933,555
THE SOLDERLESS, TAPELESS WIRE CONNECTORS

Another LIFETIME CONNECTOR for Pigtail Splices

IDEAL SET SCREW WIRE CONNECTORS

If you prefer a set-screw type connector, try this one! Unique quality features include the longest skirt and heaviest shell ever used in a connector of this type. Withstands 8000 volts dielectric and air-gap tests. Approved for 600 volts as pressure cable connectors for general use in branch circuit wiring, fixture hanging, machine and appliance hook up. Easy to use and re-use — no solder, tape or special tools needed. Two contractor sizes for all common wire combinations.

are now Fully Approved for ALL "Pigtail" Splices in ALL Types of Branch Circuit Wiring

Now you can use IDEAL "Wire-Nuts"—the industry's favorite wire connector—from cellar to attic and all over the shop or plant! Contractors sizes 74B and 76B are fully approved as pressure cable connectors for general use—with conduit, armored cable, non-metallic sheath and open wiring—for all common wire combinations. Use them on every job—and profit from the easiest, simplest method known for making stronger, safer pigtail splices that last a lifetime. Order a generous supply today!

See—Or Ask For—Your Ideal Catalog

IDEAL INDUSTRIES, Inc.
SYCAMORE, ILLINOIS

CALL GRAYBAR FIRST FOR...
Graybar Everything Electrical

ONLY THOR OFFERS SO MANY FEATURES

IN PORTABLE ELECTRIC SAWS

EXCLUSIVE LONG-SHAFT TRANSVERSE MOTOR MOUNTING transmits as much as 25% extra power, supports blade on oversize ball bearings from one side of the tool clear to the other.

EXCLUSIVE SAFETY-LOCK SWITCH—positive protection against accidental starting.

EXCLUSIVE SHOCK-ABSORBER GEARING harnesses the added power of these great new saws, gives extra life to motor, gears, spindle and blade.

EXCLUSIVE PROTECTED DEPTH AND BEVEL SCALES are in plain sight when you use them—out of the way when you don't. Always accurate.

EXCLUSIVE EXTRA-WIDE REENFORCED STEEL SAFETY BASE for better balance—easier to handle, far safer to use.

PLUS powerful, built-in sawdust blower . . . over-size ball bearing construction . . . automatic ball bearing blade-guard . . . die-cast aluminum housings . . . steel inserts for bearings and threads . . . finger-tip depth and bevel control . . . convenient handles . . . steel rip guide . . . extra-capacity switches . . . most powerful motors ever used in electric saws.

Silver Line means "new design"—from rip guide to switch—to give you the safest, easiest handling, most powerful saws on the market today. 15 new features . . . many of them exclusive . . . each of them thoroughly field tested and approved for economical, trouble-free operation. Six sizes to meet every demand from the lightweight "6" to the sturdy "12". Try these great new Silver Line Saws now available at your Thor distributor. Independent Pneumatic Tool Co., Aurora, Illinois.

Thor PORTABLE POWER TOOLS

ELECTRIC • PNEUMATIC

CALL GRAYBAR FIRST FOR . . .

GRAYBAR Everything Electrical

JEFFERSON PRODUCTS

GEARED TO TODAY'S EXACTING REQUIREMENTS

BALLASTS for Fluorescent Lamps

CERTIFIED E-T-L Meets All Requirements of the Proposed American Standard Association Test Specification C82.1

430 MA—118V, 60 Cycle Series Sequence Ballast

The improved new Jefferson Ballast for series sequence operation of 96T12 lamps is compact, quiet, and only 12½ lbs. in weight. Its quality precision construction assures longer life, improved lamp life and all round fixture performance.

QUICK STARTING

Jefferson assures positive starts even at voltages as low as 106 volts.

COOL and HEALTHY

Operation at low temperature with low watt loss means longer healthy life.

NO HUM

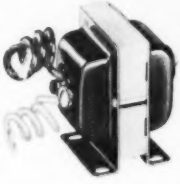
Advanced engineering and traditional Jefferson quality eliminate audible hum.

DELIVER FULL RATED WATTAGE

Both lamps get full wattage (wattage loss only 29 watts), sustain lamp brilliance.

This Very Latest Model JEFFERSON Wizard Bell Transformer

Replaces 3 Models For Door Bells, Buzzers, Door Openers and Annunciators



10-V Secondary 5-Watts Universal Mounting

Fills More Needs with Less Stock to Carry

The one Jefferson Universal-Mounting WIZARD Bell Transformer for operation of door bells, buzzers, annunciators and door openers replaces THREE models. It is designed with lip and set-screw for clamping to edge of the knock-out of the metal cover, box or cabinet with primary leads for connecting to circuit and terminals for bell wires. Mounting feet are also provided for open wiring installations. No separate plates are required. Ideal for close-quarter installations. Stocked by Electrical Wholesalers Everywhere.

Approved by Underwriters' Laboratories, Inc.

FUSES FOR BETTER PROTECTION

- THERMAL, — SAF-T-LAG DUAL ELEMENT
- RENEWABLE, — SUPER-LAG
- RENEWABLE, — JEFFERSON-UNION
- NON-RENEWABLE
- FUSTATS • PLUG FUSES

Select the type for your particular needs

The Jefferson SAF-T-LAG is a heavy-duty Thermal Non-Renewable Fuse with an extra *Safe-Time-Lag* to protect equipment and machinery,—it acts positively on dangerous overloads yet prevents premature and unnecessary blowing on harmless, temporary overloads. The copper elements used have much lower resistance than conventional zinc elements providing 50% lower watt loss and cooler operation.

Jefferson SUPER-LAG *Renewable Fuses* with the long time lag for motor loads and UNION Renewable Fuses for circuits where surges are not pronounced. A minimum number of parts permits quick and easy removal.

Where overloads are not a frequent occurrence, as for lighting circuits, the Jefferson *Non-Renewable Fuse* is the choice for economical, dependable service.

The Jefferson Fustat prevents tampering or over-fusing. It has a built-in *thermal cutout* which provides a *long time lag*. Made in capacities of .3 to 30 amperes, for 115-volt circuits.

Plug Fuses, well-made of strong molded insulation, — 3 to 30 amperes, for 115-volt circuits.

JEFFERSON ELECTRIC COMPANY • Bellwood, Illinois

In Canada: *Canadian Jefferson Electric Co., Ltd., 384 Pape Ave., Toronto, Ont.*

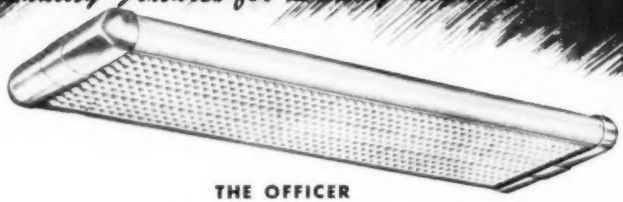
CALL GRAYBAR FIRST FOR . . . Everything Electrical

A BETTER FIXTURE FOR EVERY LIGHTING NEED... from

Leader

Look to Leader for the finest in distinctive lighting for offices, commercial interiors, banks . . . proper styling and good looks in lighting for schools, libraries . . . flexibility and convenience in lighting for industry. Superbly efficient operation, unusual simplicity of installation and ease of servicing are outstanding features of the entire Leader line. Whatever your requirements may be, look to Leader for a lighting fixture to fill every lighting need.

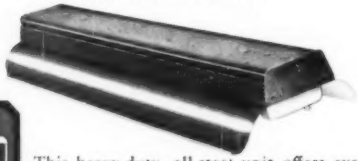
Quality Fixtures for Quality Lighting



THE OFFICER

America's finest fluorescent fixture for interiors of distinction. Streamlined and gracefully proportioned. Translucent plastic side panels, one-piece injection moulded plastic louver with choice of 31° or 45° shielding. For two, three or four 40-watt lamps, or Slimline lamps in lengths from 48" to 96".

THE STRATOLINER



This heavy-duty, all-steel unit offers everything desired in an industrial fixture. Durable, strongly built, neat in appearance, easily serviced. Reflector finished in baked enamel or porcelain enamel (RLM approved). Available in open or closed end style for two or three 40-watt lamps, or two 85-watt lamps.

RECESSED TROFFERLITE

Leader troffer fixtures offer versatility of lighting design and high light values. Shown here with matching incandescent spotlight. Trofferlites are available with a wide variety of glass or specialized lenses, also in louvered, baffled and open styles. Complete range of lengths, choice of regular or shallow depth, 12" or 24" width, for from two to eight lamps.

Sold and installed by the better electrical dealers and contractors

Leader America's No. 1 Lighting Equipment Manufacturer

LEADER ELECTRIC COMPANY • 3500 North Kedzie Avenue • Chicago 18, Illinois

Leader Electric—Western: 800 One Hundredth Avenue, Oakland 3, California
Campbell—Leader, Ltd.: Brantford, Ontario, Canada

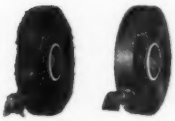
CALL GRAYBAR FIRST FOR . . .

Graybar Everything Electrical

Does the tape you're using have all these features?

check this list and see!

GRAYBAR FRICTION TAPE



☐ **No raveling, no undersized rolls.** Graybar friction tape is wound under tension and cut with a neat, smooth edge — it can't ravel and waste tape. Cut to exact lengths, you get guaranteed full footage in every roll. How do you score your present tape ?

☐ **High insulation value and resistance to water.** Virtually free of pinholes, Graybar friction tape provides maximum insulation and water resistance. How do you score your present tape ?

☐ **Improved tensile strength.** Graybar friction tape is factory-tested to make sure it has the strength needed for even the tightest wrappings. How do you score your present tape ?

☐ **Maximum adhesion.** Graybar friction tape grips tight and holds fast. Tests show that 1" Graybar tape unwinds only 1" per minute under a 10-lb. pull. How do you score your present tape ?

☐ **Ages slowly.** Graybar friction tape is regularly subjected to electric-oven tests — you can be sure that every roll provides the same degree of long service life. How do you score your present tape ?

GRAYBAR RUBBER TAPE

☐ **High dielectric strength.** Graybar rubber tape contains no fabric — you get a solid rubber covering of high dielectric strength. How do you score your present tape ?

☐ **High strength and stretch ratios.** Graybar rubber tape allows tight wrappings — even on the most irregular surfaces. Test Graybar tape yourself to see how far it will stretch without breaking. How do you score your present tape ?

☐ **Slow aging.** Graybar rubber tape is manufactured from special rubber compounds that retain their insulating properties over long periods. How do you rate your present tape ?

☐ **Forms solid, waterproof joints.** Graybar rubber tape amalgamates into a solid, impervious mass of rubber. Test it yourself by wrapping it around a pencil. Then try to separate the layers without cutting. It can't be done! How do you score your present tape ?

There's a Graybar Tape for every job

AMAZON A.S.T.M. TAPES —
Where quality is of prime importance

AMAZON FRICTION TAPE
meets Government Specification HH-T-101 Grade A.

AMAZON RUBBER TAPE
withstands dielectric test of at least 350 volts per mil of thickness . . . meets Government Specification JJ-T-11C.

VICTOR TAPES —
for general use

VICTOR FRICTION TAPE
is of uniform quality and is recommended for general commercial use.

VICTOR RUBBER TAPE
withstands dielectric test of 300 volts per mil of thickness . . . gives excellent service both indoors and out.

STICKA FRICTION TAPE — a reliable, low-cost tape for all your everyday jobs. Buy it by the roll or in the convenient ten-roll package.

Graybar Electric Company, Inc. 137-44
420 Lexington Avenue, New York 17, N. Y.

Please send me a free sample of Sticka tape and your folder "What to look for in Friction and Rubber Tape."

Name _____ Title _____

Company _____

Address _____

City _____ Zone ____ State _____

SEND FOR A FREE SAMPLE.
For a sample of Sticka tape as well as complete information about all the other Graybar tapes, send this coupon.

CALL GRAYBAR FIRST FOR . . .

Graybar *Everything Electrical*

Art Museum

Chooses Lighting Artistry by LITECONTROL

JOB: Art Museum of New Britain Institute, Stanley Wing, New Britain, Conn.
ARCHITECT: Delbert K. Perry & Associate, John Perry, New Britain, Conn.
ELECTRICAL CONTRACTOR: Peterson Electric Co., New Britain, Conn.
FIXTURES: 30 Special No. F74 4-lamp fixtures.
4 Special 4-lamp corner mitred fixtures.
LAMPS: Standard warm white fluorescent.
AREA: 32' x 60' x 12' ceiling height — 1,920 square feet.
WATTS: 6,500.
WATTS PER SQUARE FOOT: 3.3.
AVERAGE INTENSITY ON PAINTINGS, vertical plane (outside row of lamps only) 20 footcandles in service. (With all lamps on) 32 footcandles in service.

Here paints the magic brush of light . . . custom-tailored by LITECONTROL . . . by the ingenious modification of *standard Litecontrol fixtures.*

But because they are crafted by lighting artisans . . . and made in many styles and designs . . . LITECONTROL fixtures provide installations which are "standard" in price only, definitely *custom* in appearance and performance.

Problem here was to enable paintings on wall to be featured or, when desired, to permit featuring of floor displays (see small photo). *Planned Lighting by Litecontrol* provided fixtures with outside lamps operating independently of inside lamps, with light shielded by a vertical baffle. Thus, the outside row alone evenly illuminates the paintings around the walls, or the inside row alone can be used to highlight center displays. Note how the fixture row follows the room contour, even at the mitred walls, for evenness of illumination.

On your next lighting problem, call in LITECONTROL — *and save.*

LC

LITECONTROL *Fixtures*

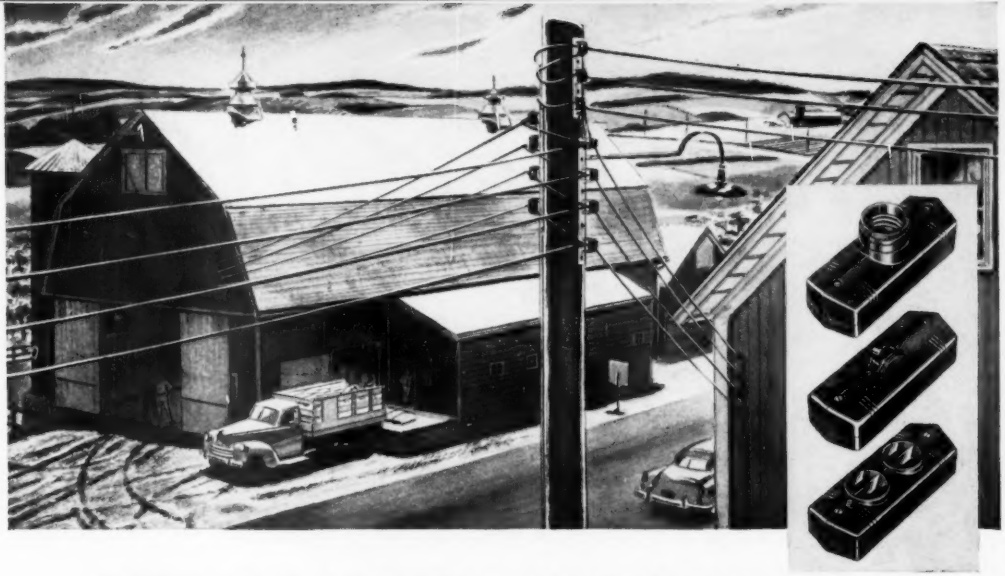
KEEP UPKEEP DOWN

See You at Booth 102, Lighting Exposition

LITECONTROL CORPORATION, 36 Pleasant Street, Watertown 72, Massachusetts

DESIGNERS, ENGINEERS AND MANUFACTURERS OF FLUORESCENT LIGHTING EQUIPMENT DISTRIBUTED ONLY THROUGH ACCREDITED WHOLESALERS

CALL GRAYBAR FIRST FOR . . . Everything Electrical



SIMPLER! SAFER! SPEEDIER!

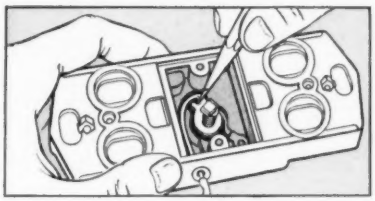
Monowatt SURF-A-LINE makes surface wiring jobs more profitable

More surface jobs come your way when you use Monowatt's Surf-A-Line. And they're more profitable jobs! That's because you can wire barns, basements, garages, attics—any surface job —*faster* . . . at lower *cost*, with these simplified wiring devices.

They're simple to install. Device mounts easily on joist or studding; each outlet is completely wired with one unit. Monowatt urea base wiring devices have been in actual field use for over two years without a single reported failure.

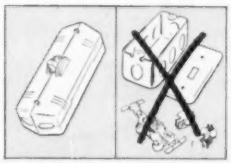
Find out more about the Monowatt Surf-A-Line surface wiring devices for fast, permanent wiring. Discover what a difference they can make in on-the-job time . . . in your profit margin. For descriptive folder, write to Monowatt, A Department of General Electric, Providence 7, Rhode Island.

MEET FEDERAL UL REA SPECIFICATIONS

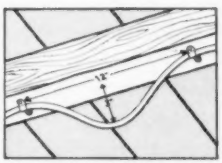


NEW NYLON INSULATOR

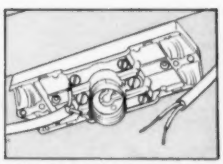
Nylon ratchet mechanism insulates pull chain; arc-resistant urea bases resist tracking, even when device is used under severe conditions, as in barns where dust, chaff and moisture are present.



Save up to 50% Installation Time on each outlet installed. Monowatt Surface Wiring Devices combine outlet box, device, cover and fittings in one unit. Listed by Underwriters' Laboratories and meet REA and Federal Specifications.



Conserves Materials — Since it's not necessary to leave as much cable (about 3") where device is to be mounted, there is a saving of 6" to 8" of cable at each outlet (approved for use with building wire, non-metallic or armored cable).



Easier-to-Wire — Device is simply screwed down and knockouts removed. Conductors are attached to binding screws. Bus Bars which carry current for through wiring eliminate need for splicing and soldering.

MONOWATT

A DEPARTMENT OF GENERAL ELECTRIC COMPANY, PROVIDENCE 7, R. I.

CALL GRAYBAR FIRST FOR . . .

GRAYBAR Everything Electrical

MERCOID

A SYMBOL OF DEPENDABILITY IN CONTROLS

THEY ARE USED FOR THE CONTROL OF TEMPERATURE, PRESSURE, LIQUID LEVEL AND MECHANICAL OPERATIONS.

THE REASON FOR THE MERCURY SWITCH IS THE ADDED SAFETY-BETTER PERFORMANCE AND LONGER CONTROL LIFE-ALL OF WHICH ARE IMPORTANT WHEREVER CONTROLS ARE REQUIRED

IT WILL PAY YOU TO SPECIFY MERCOID CONTROLS

Graybar carries a representative line of standard Mercoid Controls. Consult their catalog. For more data write for Mercoid catalog - 700A

THE MERCOID CORPORATION ✱ 4201 BELMONT AV., CHICAGO 41, ILL.

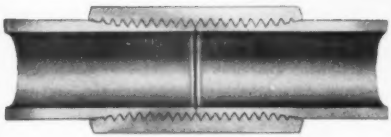
CALL GRAYBAR FIRST FOR . . .

Graybar Everything Electrical

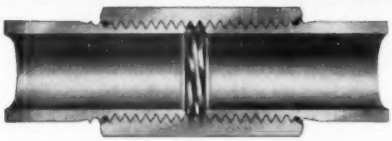
IT'S FORTIFIED FOR LIFE-TIME PROTECTION

SPECIFY NATIONAL ELECTRIC SHERARDUCT

To Keep Wiring Safe, PERMANENTLY



SHERARDUCT COUPLING—All surfaces and threads are Sherardized. Accurately undercut threads permit completely closed joints—no raw threads exposed—no gaps to interfere with the easy fishing of wires.



ORDINARY COUPLING—Raw threads meet raw threads—accelerates rust—weakens joint. Threads exposed in gaps trap wire ends and make the fishing of wires difficult.

FULL WEIGHT . . .

THREADED . . .

RIGID STEEL CONDUIT

When the job calls for a conduit that must withstand the test of time—there's only one *Sherarduct!* Sherarduct is a rigid steel conduit that is permanently rust-proof. The zinc protective coating alloyed to the steel by the special Sherardizing process will not crack or peel. Sherarduct is heavy-walled, threaded, smooth inside to assure easy fishing.

NATIONAL ELECTRIC PRODUCTS
WIRING SYSTEMS
WIRES AND CABLES

National Electric
PRODUCTS CORPORATION

1301 CHAMBER OF COMMERCE BLDG., PITTSBURGH 19, PA.

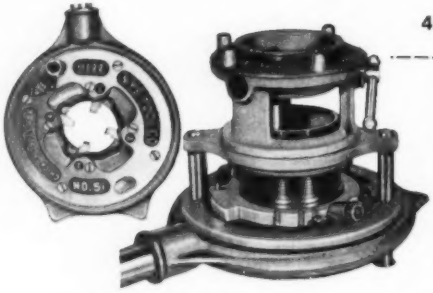
CALL GRAYBAR FIRST FOR . . .

CITYSIDER Everything Electrical

NYE PIPE TOOLS

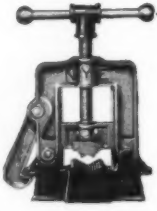
"The Tools You Swear By and Never At"

48 YEARS OF EXPERIENCE



No. 51 RATCHET TYPE PIPE THREADER

Threads pipe 1", 1¼", 1½", 2" with one set of high speed dies, cutting taper thread or straight thread for electrical conduit. Quick opening threader for use with Power or by Hand—dies open automatically when thread is complete—no jamming. Stock is removed from pipe with chasers in open position—this eliminates tearing of threads and injury to chasers. Size selector permits changing in two seconds and makes possible deeper or shallower thread adjustment. Illustrated booklet gives graphic details—send for it.



IMPROVED SELF-LOCKING VISES

Have long jaws to insure more grip and less marring. Smallest rods are held securely at either side of vise jaws. Size ranges ⅛" to 4½".

TRIAD RATCHET STOCKS

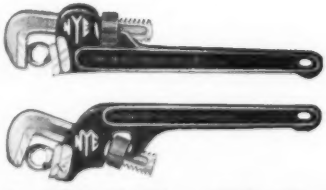
With one piece dies assuring perfect alignment and size. Die is locked in place by threaded screw cap, easily removed with a few turns. Dies can be reversed quickly for threading a short stub.

TUBE CUTTER WITH ROLLERS

Exceptionally keen cutter wheels for copper, brass, and lead tubing. Capacities of 3/16" to ⅞" O.D. and ½" to 2⅛" O.D.

BIT BRACE REAMERS

Spiral Flute type shown. These reamers made with tapered shank to fit any standard bit brace. Spiral Flutes give a shearing action, assuring operator a clean and satisfactory job. Size range ⅛" to 2".



PIPE WRENCHES

Hardened forged jaws. Special alloy malleable iron handle. Hook jaws ground to prevent slippage. Baked enamel finish.

NYE TOOL COMPANY

★ 4130 FULLERTON AVE. CHICAGO 39, ILL.

CALL GRAYBAR FIRST FOR . . .

Everything Electrical

1. Lasts indefinitely.
2. Impermeable wall and tight joints prevent corrosive ground waters from entering.
3. Light, easy to handle and tool on the job.
4. Low coefficient of friction keeps pulling tensions on cable to minimum.
5. Resists acids, alkalis, salt, grease, oil.
6. Lays faster and at lower cost than any other type of conduit.

ORANGEBURG Standard
installed with
concrete encasement

ORANGEBURG Nocrete
installed without
concrete encasement

"ORANGEBURG Fibre Conduit, a sure profit maker for me"

says contractor

Orangeburg is a leader in every city and state. Men responsible for protecting electric cables know they can rely on Orangeburg Fibre Conduit, a favorite for over 58 years.

Orangeburg
Manufacturing Co., Inc.
Orangeburg, N. Y.

Distributed by GraybaR ELECTRIC COMPANY

CALL GRAYBAR FIRST FOR . . . Everything Electrical

Coupling Conduit? it's easy... with an O.Z. Split Coupling

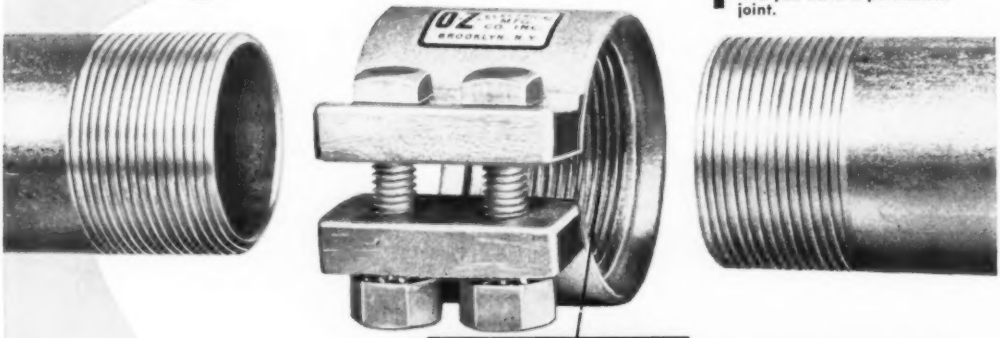
UL Approved

THESE YOUR PROBLEMS?

Not enough space
No room for wrench
Hard to get at
Conduits can't be turned

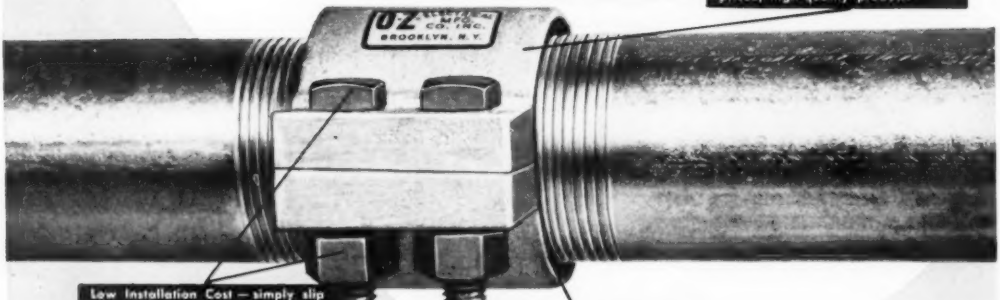
HERE'S YOUR ANSWER!

O. Z. is the simple, dependable way to couple conduit. Just butt the conduit ends within the opened O. Z. Split Coupling, tighten two nuts and you have a permanent joint.



Interior Threading — meshes with conduit threading for a rigid close-fitting connection.

Low Price — simple, one-piece malleable iron construction assures low-priced, high-quality product.



Low Installation Cost — simply slip over conduit ends and tighten nuts to close fitting. Bolt head is held in place by coupling shoulder.

Available for conduit sizes ranging from ½" to 5".

8192

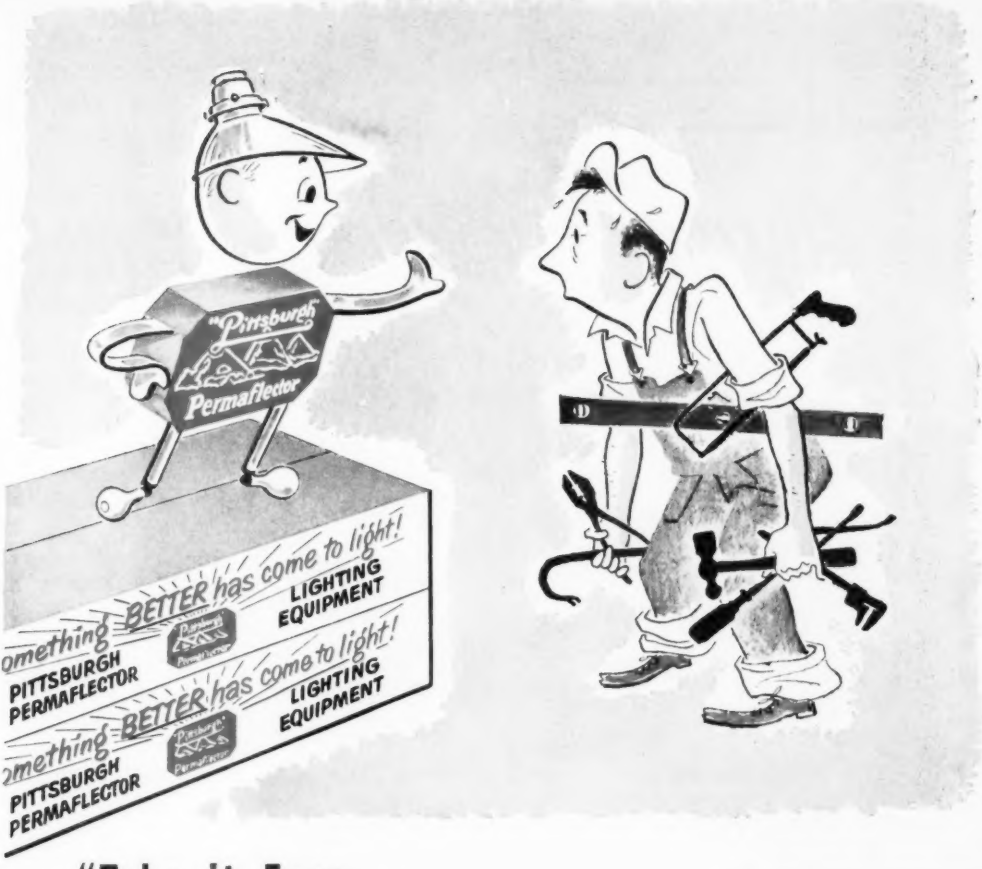
O.Z. ELECTRICAL MANUFACTURING COMPANY, INC.
262 BOND STREET — BROOKLYN 2, N. Y.

Your local O. Z. distributor is ready *now* to serve you from stock. Get in touch with him for further information on the complete, dependable O. Z. line of electrical fittings.

CONDUIT FITTINGS • CABLE TERMINATORS • GROUNDING DEVICES
CAST IRON BOXES • SOLDERLESS CONNECTORS • POWER CONNECTORS

CALL GRAYBAR FIRST FOR . . .

GRAYBAR Everything Electrical



"Take it Easy... the Job's Half Done!"

The job's half done when you install Pittsburgh Permaflector Lighting Equipment. All Fluorescent Units come compactly wired and ready-to-install. They go up quickly and easily. They save many man hours of installation time.

In end-to-end mounting, Pittsburgh Permaflector Fluorescent Units lock together and align perfectly. Squares and other patterns are a "natural" to install.

Next time—take it easy. Use time-saving, labor-saving Pittsburgh Permaflector Lighting Equipment.

PERMAFLECTOR PETE SAYS:

"Pittsburgh Lighting + Saved Manhours = MORE" PROFIT

Write today for full profit advantages of working with flexible Pittsburgh Permaflector Lighting Equipment.

"Pittsburgh" Permaflector

Pittsburgh Reflector Company

404 OLIVER BUILDING · PITTSBURGH 22, PENNSYLVANIA

Permaflector Lighting Engineers in All Principal Cities

DISTRIBUTED BY ELECTRICAL WHOLESALERS EVERYWHERE • PERMAFLECTOR LIGHTING ENGINEERS IN ALL PRINCIPAL CITIES

CALL GRAYBAR FIRST FOR... Everything Electrical

Always a good show..

Studios of WGN and WGN-TV, Chicago, where ELECTRUNITE E.M.T. protects power and communications circuits.

Workmen find ELECTRUNITE E.M.T. easy to cut, easy to bend accurately, easy to pull wires through.

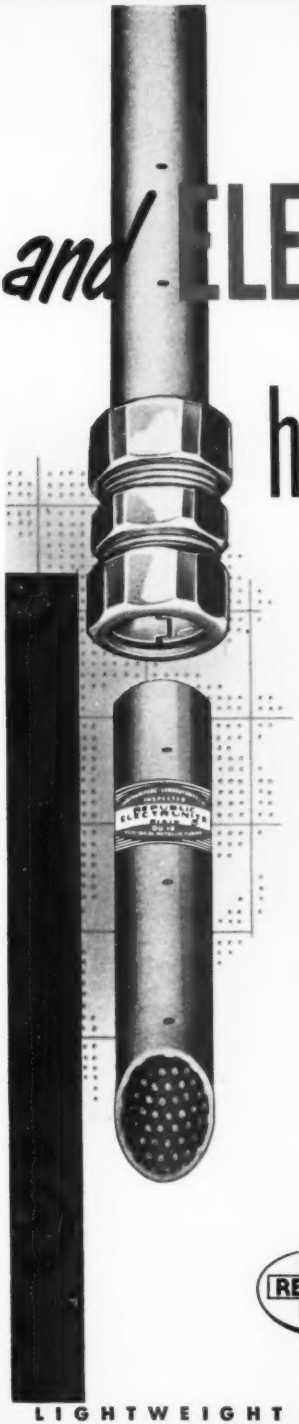
CALL GRAYBAR FIRST FOR . . .

Graybar Everything Electrical

and ELECTRUNITE E.M.T.

helps get it on the air

...Ever Since 1936



Another customer who came back for more!

When the studios of Radio Station WGN were built in 1936, the electrical and communication circuits were encased in ELECTRUNITE E.M.T.

In 1951, when these studios were expanded to house Television Station WGN-TV, ELECTRUNITE E.M.T. again got the job. This light-and-strong steel raceway protects vital circuits in large and small buildings from mechanical injury, moisture, and fire.

ELECTRUNITE E.M.T. is approved by the National Electrical code for concealed, exposed, and concrete-slab installations. It carries the Underwriters' Laboratories Seal of Approval. It is being used in leading construction projects throughout the country . . . in hospitals, industrials, schools, churches and office buildings.

Your journeyman will like working with ELECTRUNITE E.M.T. ...it's easy to bend accurately with the exclusive "Inch-Marked" feature . . . it's easy to pull wires along the exclusive inside-knurled surfaces . . . it's readily joined without turning lines using concrete-tight compression fittings.

Convince yourself . . . try ELECTRUNITE on your next project. Ask your distributor for ELECTRUNITE, the "Inched-Marked" E.M.T.

REPUBLIC STEEL CORPORATION
STEEL AND TUBES DIVISION
224 EAST 131st STREET • CLEVELAND 8, OHIO

REPUBLIC STEEL

Republic
ELECTRUNITE E.M.T.

LIGHTWEIGHT THREADLESS RIGID STEEL RACEWAY

CALL GRAYBAR FIRST FOR . . .

Graybar Everything Electrical

R&S Industrial LIGHTING FIXTURES

...3 Complete Lines meet every safety lighting need!

EXPLOSION PROOF

CLASS I, GROUPS C & D

For greater safety in hazardous locations wherever flammable materials are made or used. A complete line is available in pendent, ceiling, bracket and hand types — from 100 Watts through 500 Watt sizes. Standard conduit bases permit interchangeability of reflector globe assemblies.

WRITE FOR CATALOG No. H-47-4

DUST-TIGHT

CLASS II, GROUPS E, F & G AND CLASS III

For hazardous locations where flammable or explosive dusts are present. Streamlined design prevents dangerous accumulation of dust particles. Two exclusive design features facilitate easy cleaning and relamping. Standard pendent and junction box bases accommodate any style of fixture — globe — assembly interchangeably in either 100 Watt or 200 Watt sizes.

WRITE FOR DATA SHEET No. 7151-4

VAPORTIGHT

For efficient illumination and maximum indoor and outdoor protection against non-inflammable gases, vapors, dusts and moisture. A complete line available in pendent, ceiling and bracket types from 15 Watts through 500 Watt sizes. Bases remain vaportight when globes are removed or broken in service.

WRITE FOR CATALOG No. 9048-4

50 ANNIVERSARY 1902-1952

R&S also makes a complete line of marine fixtures and fittings

RUSSELL & STOLL COMPANY, INC. • 125 BARCLAY STREET, NEW YORK 7, N. Y. D-8

RUSSELL & STOLL

PRECISION-BUILT ELECTRICAL EQUIPMENT—SINCE 1902

CALL GRAYBAR FIRST FOR . . . Everything Electrical

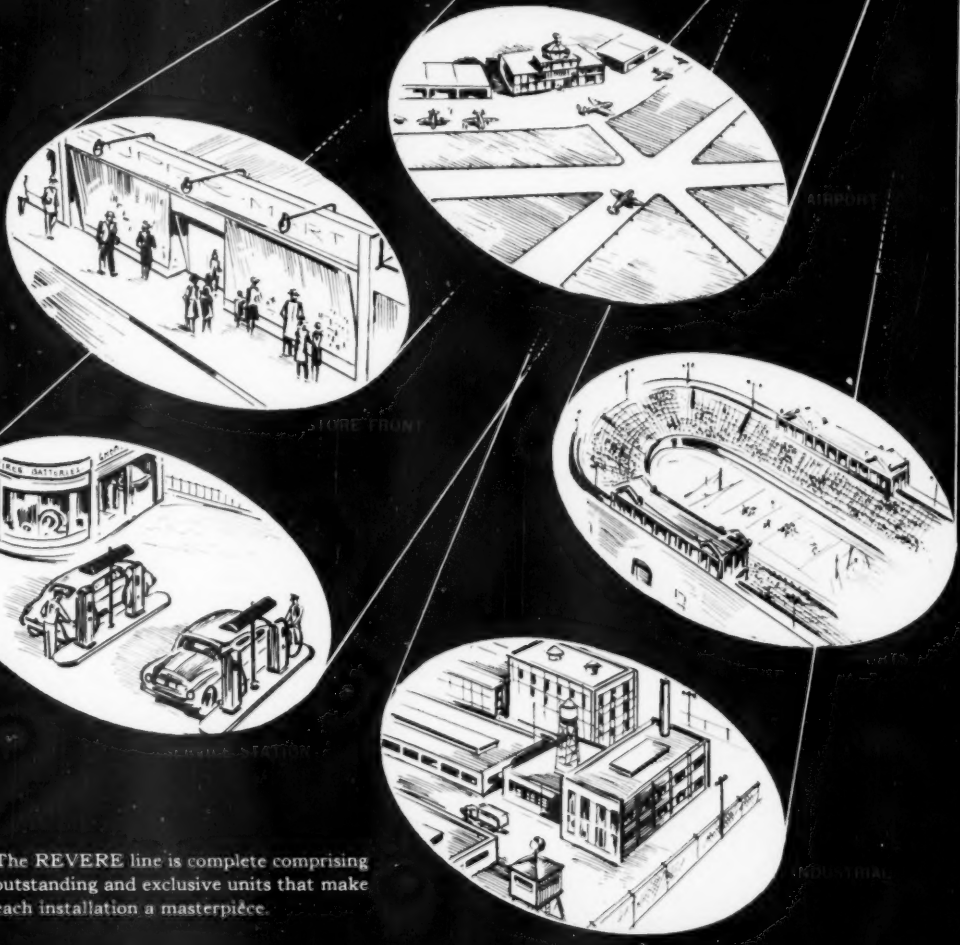
SELL

Revere

ELECTRIC MFG. CO. CHICAGO, U.S.A.

LIGHTING EQUIPMENT

for a dominant job in all fields



The REVERE line is complete comprising outstanding and exclusive units that make each installation a masterpiece.

REVERE ELECTRIC MFG. CO. • 6017 BROADWAY • CHICAGO 40, ILLINOIS

CALL GRAYBAR FIRST FOR...

Everything Electrical

SANGAMO the Time Switch with the *Automatic Memory*...

A Sangamo Astronomic Time Switch controls the circuits for the protective flood and yard lighting in this defense factory. Other types are available for practically any conceivable industrial use.

The operation of this Sangamo Astronomic Time Switch automatically compensates daily in accordance with sunset and sunrise.

is often the answer to the timing needs OF INDUSTRIAL PLANTS

The growing shortage of available industrial manpower makes automatic devices with which to control manufacturing processes more important than ever. The Sangamo Time Switch is such a device. It will solve practically any problem concerning daily sequence timing in industry. Protective floodlighting control is a typical example where the Sangamo Time Switch eliminates the need for human attendance. So is the use of these switches for the control of pre-heating before workshifts, or the continuance of certain process cycles after workshifts. Below are a few suggestions where Sangamo Time Switches can serve industry.

INDUSTRIAL APPLICATIONS

For daily pre-heating:

Lead pots for solder operations.
Zinc for injection molding.
Type metal in type foundries.
Dies in plastic molding presses.
Glue in woodworking shops.
Tanks for galvanize dipping.
Electric ovens and furnaces.
Infra-red paint dryers.
Electronic testing equipment.
Soldering irons on assembly lines.

For daily circuit control:

Yard floodlights.
Runway and hall lights.
Electric factory signs.
Pumps, compressors.
Water softeners.
Mixing equipment.
Electric doors and gates.
Air conditioning.
Alarm systems.
Exhaust fans.
Electric valves.
Two-level thermostats.

SANGAMO ELECTRIC COMPANY

SPRINGFIELD, ILLINOIS

Get the full story—write for Catalog No. 1010-A today.

ST51-7

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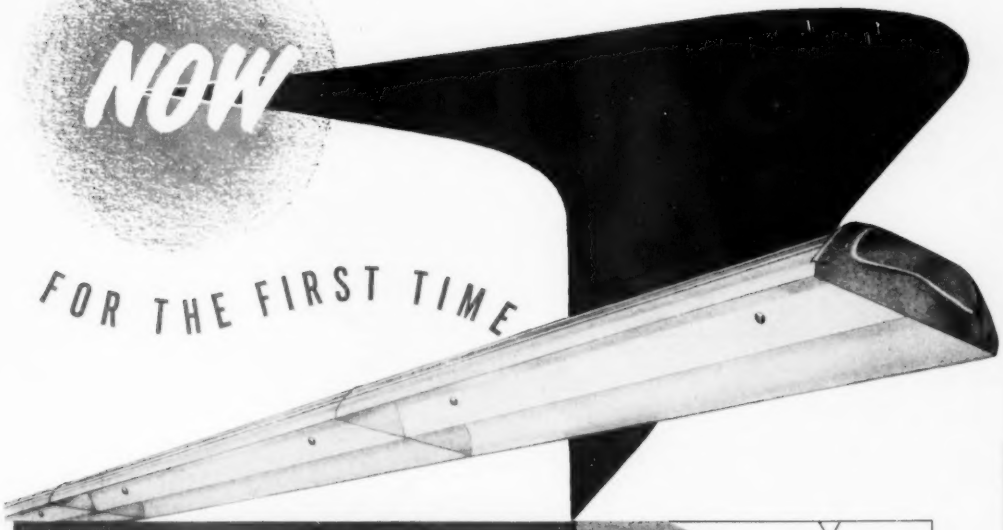
NOW

FOR THE FIRST TIME



QUALITY INDUSTRIAL LIGHTING

which . . . introduces into the factory a unique and original design that incorporates all known techniques of good lighting;

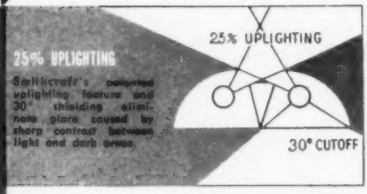
which . . . gives better quality illumination than any industrial fixture yet developed;

which . . . provides continuous lines of light with no dark areas between ends of the lumin-

THE A·L·S SLIMLINE

AMERICA'S LIGHTING STANDARD OF INDUSTRIAL LIGHTING

More than just another industrial fluorescent fixture, the new Smithcraft A L S is a revolutionary departure from the old type luminaire. Now uplighting and many other features have been scientifically incorporated to advance ocular comfort never before achieved in industrial lighting. 25 % uplighting (as against 5% in most units); 30° cutoff (as against 13° in most units); light-reflecting sides; continuous lines of light with no dark areas. All these features promote better lighting conditions and reduce objectionable glare caused by sharp contrasts and dark areas. And the A L S Unit stays clean longer because of airflow construction. Here is unparalleled lighting comfort, rigidity, safety and high efficiency for industrial areas.



25% UPLIGHTING

Smithcraft's patented uplighting feature and 30° shielding eliminate glare caused by sharp contrast between light and dark areas.

STAYS CLEAN LONGER

Engineered design minimizes the accumulation of air-borne dust by generating a non-turbulent airflow through reflector. Yet lamps are roofed over to protect them from falling dust.

NO DARK AREAS

Continuous lines of light with no interrupting dark areas between fixtures. Interlocking of lampholders eliminates these dark areas.

A L S comes in 4'-6'-8' lengths. Baffles are available to give additional lengthwise shielding. Send for further details on Smithcraft's new A L S Unit.

See it at the 4th International Lighting Exposition in Cleveland (May 6-9).

America's finest fluorescent fixtures

Smithcraft

LIGHTING DIVISION

CHELSEA 50, MASSACHUSETTS

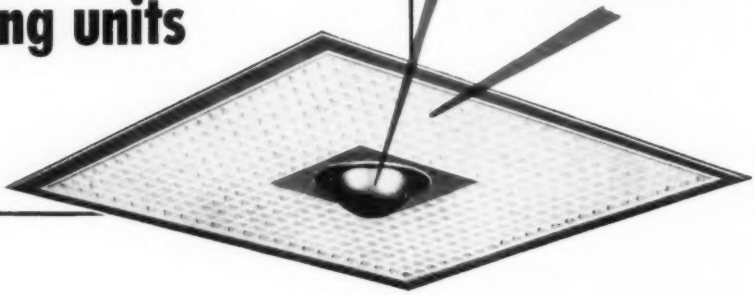
CALL GRAYBAR FIRST FOR . . .

GRAYBAR Everything Electrical

Skylike® blends 2 types of lighting units into 1

1. the soft, indirect light of silvered-bowl incandescent lamps.

2. the sleek, modern look of fluorescent-type troffers.



Silvray SKYLIKE lighting offers advantages found in no other system, yet uses only silvered-bowl incandescent lamps.

Designed along modular concepts for recessed or semi-recessed use, SKYLIKE fixtures may also be surface-mounted in old or remodeled interiors without sacrifice in lighting quality.

Silvray SKYLIKE units are amazingly economical in initial cost – only ½ to ⅓ as much as other equipment delivering comparable results. Ease of maintenance permits similar savings – units can be relamped from the floor and require only an occasional cleaning with a damp cloth.

SKYLIKE fixtures fit 24″ x 24″ ceiling tile . . . are light in weight, easy-to-handle, and require only minimum framing support.

Here's *real proof* of SKYLIKE efficiency . . . unretouched photographs demonstrate the versatility of the SKYLIKE louvered incandescent lighting system. In each case, the only light source used was that of the SKYLIKE units — note the soft, even distribution of light . . . the complete absence of glare, harsh shadows, and sharp light cut-off lines.

Photo by Milton Mann Studios

A unique SKYLIKE application is pictured here in the showroom of Irving A. Belking Furs in San Francisco, California.

Notice how architect Bernard J. Saboroff's gridwork of 1 x 6 pine serves to hide the unsightly high ceiling, as well as to support the patterned group of recessed Silvray SKYLIKE units. Low brightness levels and 90° shielding provide an extremely satisfactory result.

Selected for warm color and ease of installation, surface-mounted SKYLIKE units replaced out-moded globe-type units in the remodernization of the Levy Brothers Store in Elizabeth, N. J.

Variable lamp sizes — from 150 to 500 watts — permit day-to-day changes in lighting intensities. Units can also be converted for accent or directional lighting by use of a semi-silvered lamp and accessory.

Send for complete SKYLIKE information. A comprehensive booklet describing the SKYLIKE system is yours for the asking. To get your copy, write *Skylike Lighting, Inc., 101 West Main Street, Bound Brook, N. J.*

1927 1932 OUR 25TH YEAR **Silvray** *ALWAYS... the best in lighting*

SKYLIKE LIGHTING, INC. is a Silvray-associated company

CALL GRAYBAR FIRST FOR . . . Graybar Everything Electrical

the Accent's on

QUALITY

...so Lever Brothers selected quality-controlled

SPANG CENTRAL CONDUIT

to protect electrical lifelines

In the most modern soap and shortening plant in the world—recently dedicated in Los Angeles County—the emphasis is on product quality, as in all Lever Brothers Company factories.

Every part, every machine, was selected with the greatest care to eliminate interruptions that might affect the exact, careful blending of raw materials. Electrical lifelines, for instance, are safeguarded by Spang "Ceulaco" Conduit—the conduit that's quality-controlled so it is always uniform in every way, always free from defects.

Wherever reliability is a must—easier, faster installation important—outstanding architects, contractors and owners specify conduit by Spang. Approved by the National Board of Fire Underwriters and complying with the National Electrical Code, it's *made better* for *better protection* of electrical circuits.

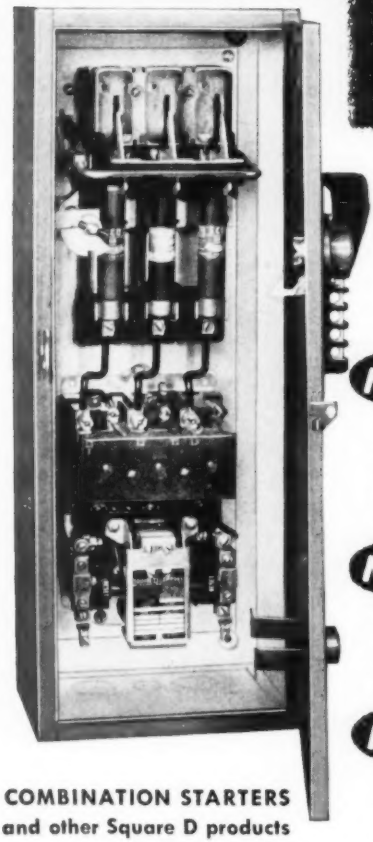
Owner:
Lever Brothers Company
Designers and Builders:
The Bechtel Corporation
Electrical Engineering:
The Bechtel Corporation
Consultant Architect:
Welton Becket and Associates

SPANG-CHALFANT
Division of The National Supply Company
GENERAL SALES OFFICE:
GRANT BUILDING, PITTSBURGH 30, PA.
District Offices and Sales Representatives
in Principal Cities

CALL GRAYBAR FIRST FOR . . .

GRAYBAR Everything Electrical

DESIGN LEADERSHIP



THIS NEW SQUARE D COMBINATION STARTER (SWITCH TYPE) offers Greater Operator Safety and Longer Motor Starter Life

NEW ***Switch Operating Mechanism*** provides maximum operator safety. Interlock prevents opening door when disconnect is on. When door is re-closed, self-aligning handle indicates true position of disconnect. Operating handle can be locked in the OFF position with one, two, three or four padlocks of varying sizes. Handle-locking mechanism also locks door.

NEW ***Switch Design*** has quick make and quick break action—no dead center—visible blades for easy checking—magnetic arc plate for high rupturing capacity—dead-front line terminals, protected by hinged arc chamber cover—positive pressure jaws and fuse clips—non-tracking insulation.

NEW ***Features in Magnetic Starter Design*** Square D's time-proven design has always provided easy installation, simple maintenance, and long life. Now, even longer life is assured by straight line, guided motion of armature and movable contact assembly which eliminates bearing and reduces wear. For added convenience and flexibility, Square D starters now have NEMA standard mounting and wiring.

COMBINATION STARTERS and other Square D products are distributed by GRAYBAR

SQUARE D COMPANY

DETROIT · MILWAUKEE · LOS ANGELES

SQUARE D COMPANY CANADA LTD., TORONTO • SQUARE D de MEXICO, S.A., MEXICO CITY, D.F.

CALL GRAYBAR FIRST FOR . . . GRAYBAR Everything Electrical

WHAT'S TEAR RESISTANCE TO YOU?

"Tear Resistance" is a term used to indicate the amount of force required to tear the jacket of a portable cord or cable. Most people never give it a thought when they are buying portable cords or cables. Yet despite this lack of attention, tear resistance is a very important quality to have in a cable because it enables the jacket to resist snagging on sharp corners and to resist tearing.

If you expect your cord or cable to stand up under hard service, the jacket must have an adequate amount of tear resistance. TIREX Cords and Cables have this tear resistance to a very high degree. That's why you should always specify and be sure that you get Simplex-TIREX Cords and Cables. They were the original hard service, rubber-jacketed cord or cable made in this country. They have remained the leaders in their field ever since.

SIMPLEX-TIREX IS A PRODUCT OF SIMPLEX RESEARCH

SIMPLEX TIREX

SIMPLEX WIRE & CABLE CO., 79 SIDNEY ST., CAMBRIDGE 39, MASS.

CALL GRAYBAR FIRST FOR...

Graybar Everything Electrical

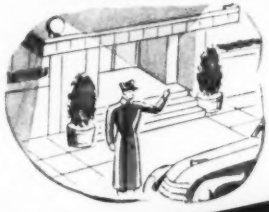
VERSATILE LIGHTING-JOB TAILORED

STEBERLITES - USE THEM SINGLY OR IN CLUSTERS

Steberlite Lamp Holder S-300 for medium base Par-38 and R-40 lamps. S-350 for Mogul base R-40 lamps.

Complete, compact, weatherproof Lamp Holders that save labor and wiring costs. Mounted singly or in clusters up to 5 they provide for general or supplementary spot and flood-lighting for used car lots, parking lots, service stations, building entrances, displays, and around farms, homes, parks, lawns, flower gardens, etc.

A small inventory of Steberlite basic units does a big sales and profit job. If a copy of Bulletin 120-50 is not at hand, write today.



By use of Adapter Box S-301, clusters up to 3 can be assembled as one unit and fitted to 1½" or 2" pipe or for connection to conduit.

All Steberlites listed by Underwriters' Laboratories, Inc.

STEBER UTILITES

For Par-38 and R-40 Reflector Sealed Beam Lamps

Listed by Underwriters' Laboratories, Inc.

Nearly four million Steber Utilites have been installed—good evidence of the tremendous market for these all-round Lamp Holders.

No. 8 Swivel Utilite.

No. 2 is for indoor or outdoor service, with U bracket for universal adjustment and round base for surface mounting or for outlet box mounting. Free Point of Sale 3-color display stand in every standard package. Utilites are a complete line of Lamp Holders, including swivel units and color equipment.

No. 2 Utilite for spot of floodlighting, indoors or out.

No. 7 Swivel Utilite, heavy base has protective rubber bumpers—also mounting holes.

STEBER FLOODLIGHTS

Fast Moving Types and Sizes That Meet 90% of All Needs

Series 57

Series 1600

Series 4000

In addition to the wide use of Steber Floodlights around industrial and commercial areas, parking lots, shipping areas, etc., Steber Floodlights are being more widely used around homes for greater outdoor living as well as for protection. Open types No. 57 and 59 (100-300 watts) and enclosed types No. 572 and 592 (100-200 watts) are particularly suited.

For larger areas the No. 1600 enclosed type with spun aluminum reflector provides high intensity lighting for billboards, outdoor displays, etc. Uses 300-500 watt Mogul base lamps.

For Sports Lighting the newly introduced 4000 Series is available. These are furnished in open and enclosed types with all standard mounting brackets. Write for Bulletin 128-50.

All Steber floodlights are listed by Underwriters' Laboratories, Inc.

STEBER MANUFACTURING CO.
Dept. 99,
Broadview (Maywood P. O.), Illinois

CALL GRAYBAR FIRST FOR . . .
Graybar Everything Electrical

GEARED TO MEET STEEL CITY CONTRACTORS' NEEDS FOR

ELECTRICAL BOXES and CONDUIT FITTINGS

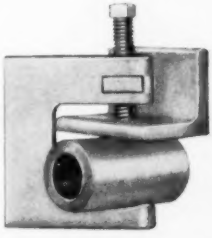
Designed to meet the most exacting requirements and save high-cost installation time

Easy-to-remove knockouts, properly placed nail holes, correctly designed clamps providing free access and positive clamping of wires, staked screws that can't fall out in transit . . . all combined to save time in installing Steel City boxes, as do the accurately machined, smooth-running threads on Steel City connectors, couplings, bushings and other conduit fittings. And, *careful inspection* along production lines and before packing, insure against defective items.

. . . and

KINDORF DEVICES

. . . now in the Steel City line, are designed to solve all pipe and conduit hanging and support problems



A Steel City Box For Every Need

Listed by Underwriters Laboratories, Inc.

STEEL CITY ELECTRIC CO.

OUTLET BOXES AND COVERS — SWITCH AND FLOOR BOXES

JUNCTION BOXES, CONDUIT FITTINGS AND ELECTRICAL SPECIALTIES

PITTSBURGH 33, PA.

CALL GRAYBAR FIRST FOR . . . Graybar Everything Electrical

Service...

Dependability...

Satisfaction...

in Signaling!

UNIPACT 2000 BELL

Need an entire new system? Or perhaps just one unit that meets present noise level needs? Buy UNIPACT. It's the best. UNIPACT is a tailor-made group of signals that are designed to master department noise levels with 17 interchangeable units—bells, buzzers, horns, chimes—all fitting one standard adapter plate. No new wiring is needed. Plant conversion is easier. Buy the proven brand—FARADAY.

FIRE ALARMS

Fire is under control from the start with a Sperti Faraday Fire Alarm System. Fire Alarm Stations, Sounding Devices, Control Panels are designed to give a fast, efficient system that stays on the job 24 hours a day.

HOSPITAL SYSTEMS

Whether it's Nurses' Call, Doctors In-and-Out Registers, Corridor Paging, or a variety of other proven hospital audible or visual signal devices, you're sure with a NAME BRAND—FARADAY. They give fast, efficient performance with a trouble-free signal system that has proven itself in hundreds of installations across the country. Write for new catalog.

HOLTZER CABOT . . . STANLEY & PATTERSON . . . FARADAY

Consolidated by:

Sperti Faraday Inc.

ADRIAN, MICHIGAN

BELLS • BUZZERS • HORNS • CHIMES • VISUAL
AND AUDIBLE PAGING DEVICES AND SYSTEMS

CALL GRAYBAR FIRST FOR . . .

GRAYBAR Everything Electrical

27 LOCK-TITE® FITTINGS handle 90% of all wiring jobs!

Cut down your inventories—and installed costs too —with the T & B Lock-Tite line of T-Parallel Taps* • Terminals • 2-Way Connectors

With *just 27 pieces* from the T & B Lock-Tite line, you can: take tee or parallel taps off 1/0 to 1,000,000 CM mains, and hook them up to #2 to 1,000,000 branches; terminate or splice cables from #4 to 1,000,000; or make 90° elbows.

That means you can handle just about *any* wiring job—with the smallest inventories you've ever carried.

LOCK-TITES GO IN FAST— AND STAY PUT

Your installed costs go way down. For a main-to-branch connection, just slip the one-piece T-Parallel Tap over the main . . . slide in the branch. Tighten *one* screw with a key wrench . . . that's all there is to it! Lock-Tites go in to *stay* — built-in lock washer takes care of *that*. Thousands of them have been in service for years, without retightening.

ENGINEERED RIGHT— DISTRIBUTED RIGHT!

Lock-Tite T-Parallel Taps, Lugs and 2-Way Connectors are typical of the many T & B quality fittings recently re-designed to give you outstanding performance at lowest installed costs. Like all T & B fittings, they're furnished under the T & B Plan 100% through your local T & B distributor.

*patented

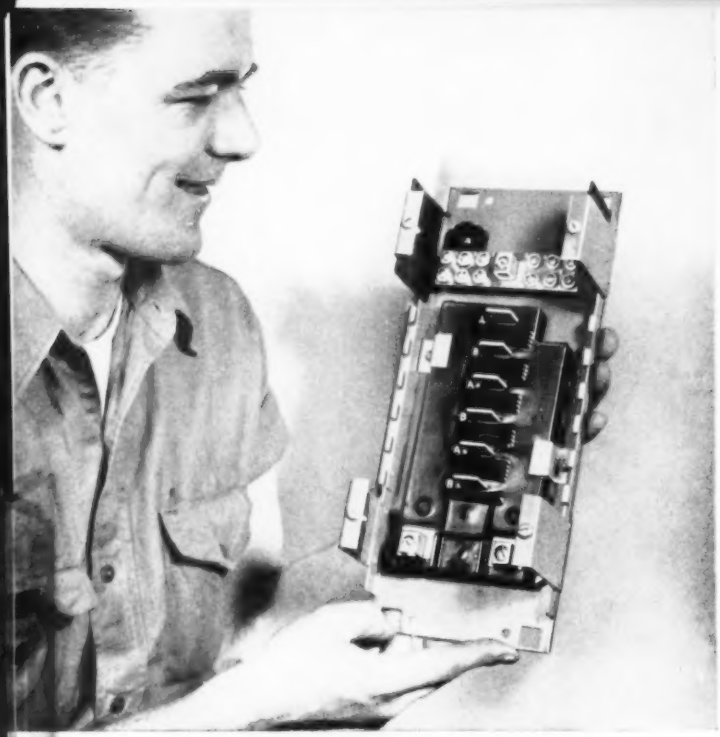
THERE'S A T&B ENGINEERED PRODUCT for every wiring job in the complete T & B line of fittings for all conductors and raceways.

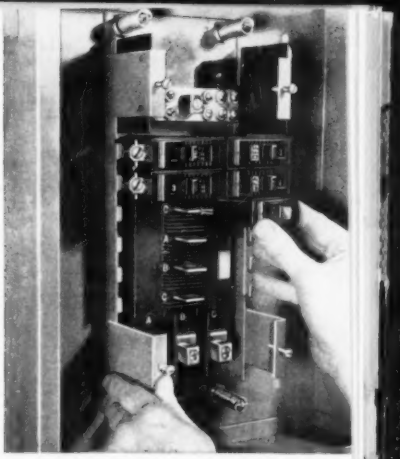
P. S. Hinjon Jr. T-Parallel Taps accommodate small taps from large mains*

THE THOMAS & BETTS CO.
INCORPORATED
34 Butler Street
Elizabeth 1, New Jersey

MANUFACTURERS OF ELECTRICAL FITTINGS SINCE 1898

CALL GRAYBAR FIRST FOR . . . Everything Electrical





ANOTHER TALKING POINT IS THE BREAKER—Trumbull's new NLTQ Panelboard introduces the first *plug-in* circuit breaker with quick-make, quick-break operation. Other features: both *thermal* and *magnetic* protection . . . trip-free . . . pressure-type, silver-plated copper plug-in contacts . . . all ratings physically interchangeable. Adjacent breakers are on alternate phases—assuring balanced loads and circuits.

New insulating material

MAKES PANELBOARD SALES!

The base of this panelboard interior is made of *Plastisol* . . . the first time this amazing plastic material has been used for this purpose.

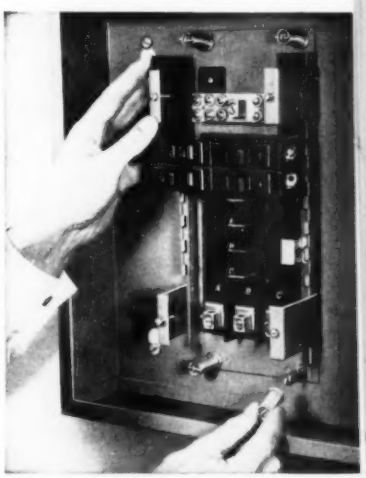
Here are some reasons for your recommending Trumbull's new NLTQ Panelboard to your customers.

Plastisol has very high thermal conductivity and is an excellent radiator of heat. Copper bus bars encased in Plastisol run 10% cooler than in open air!

SALES POINTS THAT OUT-SELL OTHER INSULATION

Other Plastisol advantages making it superior to all other types of insulation for this purpose include its ability to resist acid and alkali, high temperatures (not harmed at 212 F), tracking and carbonizing. It will not shrink or become brittle, even at minus 30 F.

Trumbull's Plastisol base is Underwriters' Laboratories, Inc. approved and endorsed by the Electrical Council.

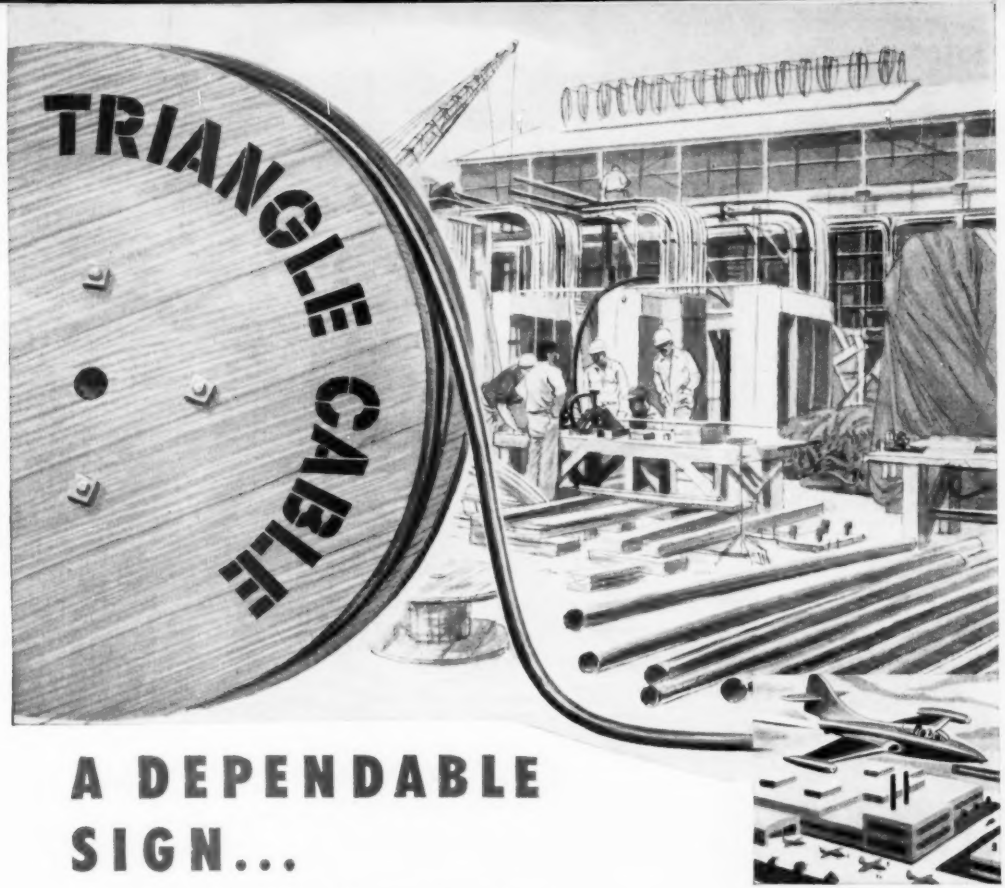


YOUR CUSTOMERS WILL LIKE QUICK INSTALLATION—Interior is mounted in box by compression springs . . . which permit easy release for removal. Springs also permit lining up fronts regardless of uneven box installation. Trumbull NLTQ panelboards with lug or circuit breaker mains come in capacities up to 225 amperes in a range of 4 to 42 circuits. Write for Bulletin TEB-14.

TRUMBULL ELECTRIC

DEPARTMENT OF GENERAL ELECTRIC COMPANY
PLAINVILLE, CONN.

CALL GRAYBAR FIRST FOR . . . Everything Electrical

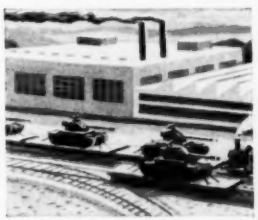


A DEPENDABLE SIGN...

that America is expanding

Thanks in great part to you who harness electricity, America is expanding rapidly in the face of world tension.

As America strengthens its defenses, the YELLOW TRIANGLE REEL and the stack of Triangle conduit become more and more familiar sights. Engineers and contractors—demanding quality wire, cable and conduit—know that ***YOU CAN DEPEND ON TRIANGLE and on the ELECTRICAL DISTRIBUTOR.***



TRIANGLE CONDUIT & CABLE CO., INC.

NEW BRUNSWICK, NEW JERSEY

"Glazon" Building Wire · "Glazon" Non-Metallic Sheathed Cable · Control Wire · Armored Cable · Service Entrance, Service Drop, Varnished Cambric Braided or Leaded, Trioprene Trench, Power & Parkway Cables · Bare Wire · Rigid Conduit Hot-Dipped Galvanized & Black Enameled · Electric Metallic Thin Wall Conduit · Flexible Steel Conduit.

CALL GRAYBAR FIRST FOR...

Graybar Everything Electrical

Light up... WITH THE Wakefield INDUSTRIAL PACEMAKER

a rugged fluorescent luminaire incorporating the design principles of modern office and drafting room luminaires—and priced to appeal to cost-conscious industrial executives.

READ THESE IMPORTANT FACTS ABOUT THE INDUSTRIAL PACEMAKER

1 The Wakefield Pacemaker transmits about half the light up, half down.

2 The downward light can be shielded efficiently by louvers, if desired. (Shielding of 25°-35° is provided.) Fleur - O - Lier classification—G-40-20-2-P.

3 Channels, channel covers, end panels, side panels and louvers are of heavy gauge steel.

4 All metal parts are processed, prior to finishing, with DURIDINE, a modern phosphatic and cleaning agent which "bonds" the white enamel durably to the surfaces.

5 ETL approved, brick type ballasts deliver full rated lamp watts and insure full light output. This feature permits the use of fewer fixtures per square feet of room area.

6 All reflecting surfaces turn downward, and do not readily retain dust. Lamps are readily removed and replaced. In the bi-pin types, starters are accessible without removing lamps. Tests show the Pacemaker can be cleaned in half the time required for the average fixture of like size.

7 The Pacemaker is designed for continuous mounting but may be mounted singly also. Support chains permit suspension of almost any distance from the ceiling.

8 The Pacemaker is designed to use either bi-pin (40W) or Slimline fluorescent lamps.

As a leader in the design and manufacture of drafting room and office lighting equipment, The F. W. Wakefield Brass Company has contributed importantly to the realization of the over-all visual environment as an aid to human efficiency and physical comfort.

Now Wakefield introduces the Industrial Pacemaker—a rugged steel luminaire which transmits about half the light up onto the ceiling, to be reflected downward in an over-all distribution pattern remarkably free from glare, shadows and sharp brightness contrasts. Such a light distribution is basic to the creation of a comfortable visual environment, whether in factory, drafting room or office. We'd like to send you a folder on the Industrial Pacemaker, giving detailed information. Write to The F. W. Wakefield Brass Company, Vermilion, Ohio.

Wakefield Over-ALL Lighting

CALL GRAYBAR FIRST FOR . . .

GRAYBAR Everything Electrical

Look for this W on EMT Fittings

From Molten Metal to Finished Fittings

•

Every Step Under WAGNER Control

• Wagner Fittings for thin-wall (EMT) conduit demonstrate the value of complete control of every step of manufacture from molten metal to finished product.

Samples are tested hourly in Wagner's modern metallurgical laboratory so that every Wagner fitting is of uniform, highest quality malleable iron.

One responsibility fuses together facilities, men, and experience to give you tough, accurately cast, precision threaded, perfectly finished, and quality inspected fittings.

This is your assurance that fittings marked W are always Right, and are *always* easy to work with.

WAGNER MALLEABLE PRODUCTS CO., 222 W. Adams St., Chicago 6, Illinois. Foundry and Plant, Decatur 60, Illinois.

Approved by Underwriters' Laboratories, Inc.

WAGNER

MALLEABLE FITTINGS

"From Molten Metal To Finished Product"

CALL GRAYBAR FIRST FOR . . .

Graybar — Everything Electrical

Dependable Electrical Measurements

FOR LABORATORY—PRODUCTION TESTING—MAINTENANCE

INDUSTRIAL CIRCUIT TESTER

(Model 785) A multi-range, multi-purpose, ultra-sensitive analyzer, for laboratory and industrial checking of electrical and electronic circuits. Has 28 practical scale ranges; measures d-c and a-c voltage, d-c and a-c current, and resistance. Accessories available to extend ranges. Compact and portable; furnished in either oak or steel case.

ULTRA SENSITIVE PORTABLE TEST INSTRUMENTS

(Model 622) High sensitivity, large scale A-C and D-C instruments of double pivoted type, ideal for precision measurement of low potentials and minute current. Available in single or multi range as D-C voltmeters, millivoltmeters, milliammeters, microammeters; and milliammeters and voltmeters in thermo and rectifier types for RF and A-C.

A-C AND D-C PORTABLE TEST INSTRUMENTS

(Model 931) Comprising a group of matched a-c and d-c portable test instruments; the universal favorites for highly accurate general test work. Available as voltmeters, ammeters, d-c and single phase a-c wattmeters—a-c and d-c voltmeters. Long, readable hand-calibrated mirror scales. The d-c instruments have new self-shielding mechanism.

HIGH FREQUENCY ELECTRONIC ANALYZER

(Model 769) A three-in-one instrument providing a self-contained Volt-Ohm-Milliammeter, a high impedance electronic D-C Volt-Ohmmeter, and a probe type vacuum tube voltmeter for use to 300 megacycles. Exceptionally stable and accurate. Has specially designed extremely small RF and D-C probes.

PANEL INSTRUMENTS OF HIGH SENSITIVITY

In all types, sizes and ranges for all critical measurements encountered in electronics, nuclear research and general testing. All D-C, rectifier type A-C and RF instruments have built-in magnetic shunts for minor adjustments if necessary.

A-C CLAMP VOLT-AMMETER

(Model 633, Type VA-1) For convenient and rapid measurement of a-c voltage and current without breaking the circuit. Jaws take insulated or non-insulated conductors up to 2" diameter. Safe, rugged, versatile. Also available as a-c clamp ammeter, without voltage ranges.

Literature on these and other WESTON instruments for electrical and electronic requirements sent on request.
WESTON Electrical Instrument Corporation, 617 Frelinghuysen Avenue, Newark 5, New Jersey
. . . manufacturers of Weston and TAGliabue instruments.

WESTON *Instruments*

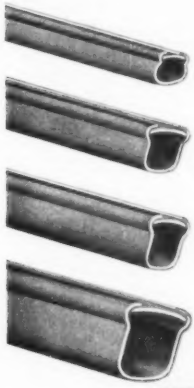
CALL GRAYBAR FIRST FOR . . .

GRAYBAR *Everything Electrical*

Know your Wiremold!

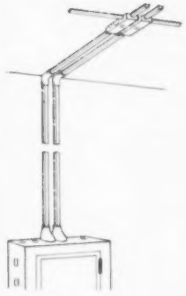
AND YOU WILL ALWAYS BE ABLE TO OFFER SERVICE GEARED TO TODAY'S NEEDS

9 INTERCONNECTABLE METAL RACEWAY SYSTEMS TO HANDLE EVERY INTERIOR WIRING JOB



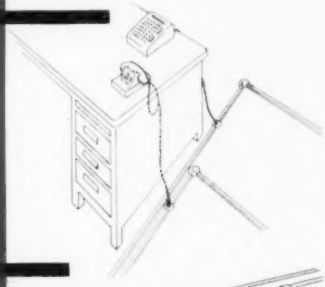
ONE-PIECE SURFACE RACEWAY SYSTEMS

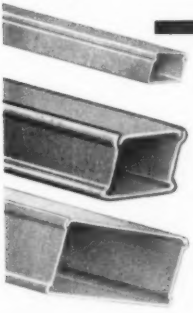
Widely used for complete new wiring jobs from panel box to outlets, as well as for the modernization of existing inadequate wiring.



PANCAKE OVERFLOOR SYSTEMS

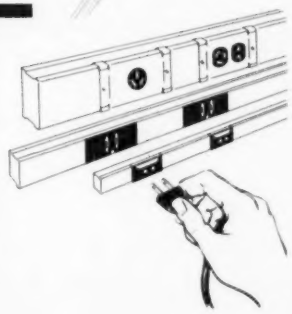
Allow extension of light, power, and telephone circuits to locations away from walls. Quickly installed *without channeling into walls or floors.*





Plugmold MULTI-OUTLET SYSTEMS

The modern way to wire for modern outlet convenience, Plugmold exactly meets the need for an easily installed, safe, and efficient means of plugging in electrical hand tools, test apparatus, work lights, etc.



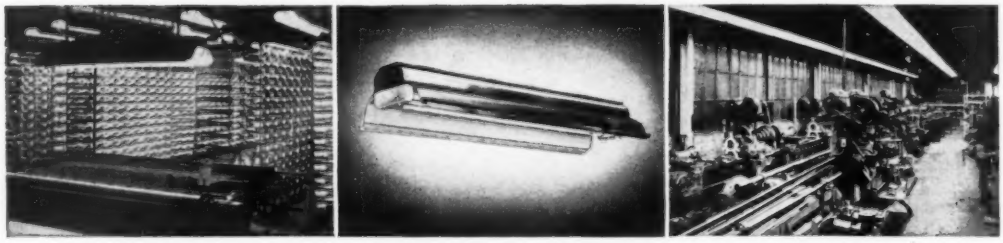
15WM52

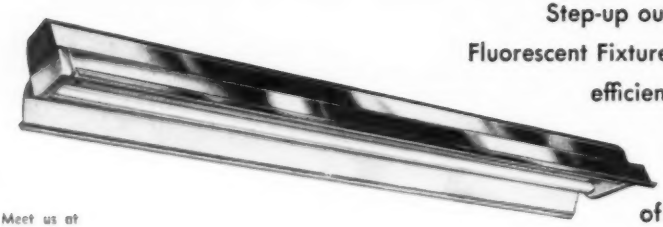
WIREMOLD . . . *the best way to wire most buildings*
. . . *the only way to wire many buildings.*

CALL GRAYBAR FIRST FOR . . . GRAYBAR Everything Electrical

Wheeler lights the way

...to INCREASED DEFENSE PRODUCTION!





Step-up output with *specialized* Wheeler Fluorescent Fixtures! Their greater lighting efficiency pays off in higher quality . . . *increased production* — on every job, in every type of plant condition. And Wheeler engineering means ease of installation and proven maintenance savings. Write Wheeler Reflector Co., 275 Congress St., Boston 10, Mass.

Meet us at
the Cleveland Lighting Exposition
May 6 thru May 9, Booths 209—210.

Wheeler REFLECTORS

WHEELER

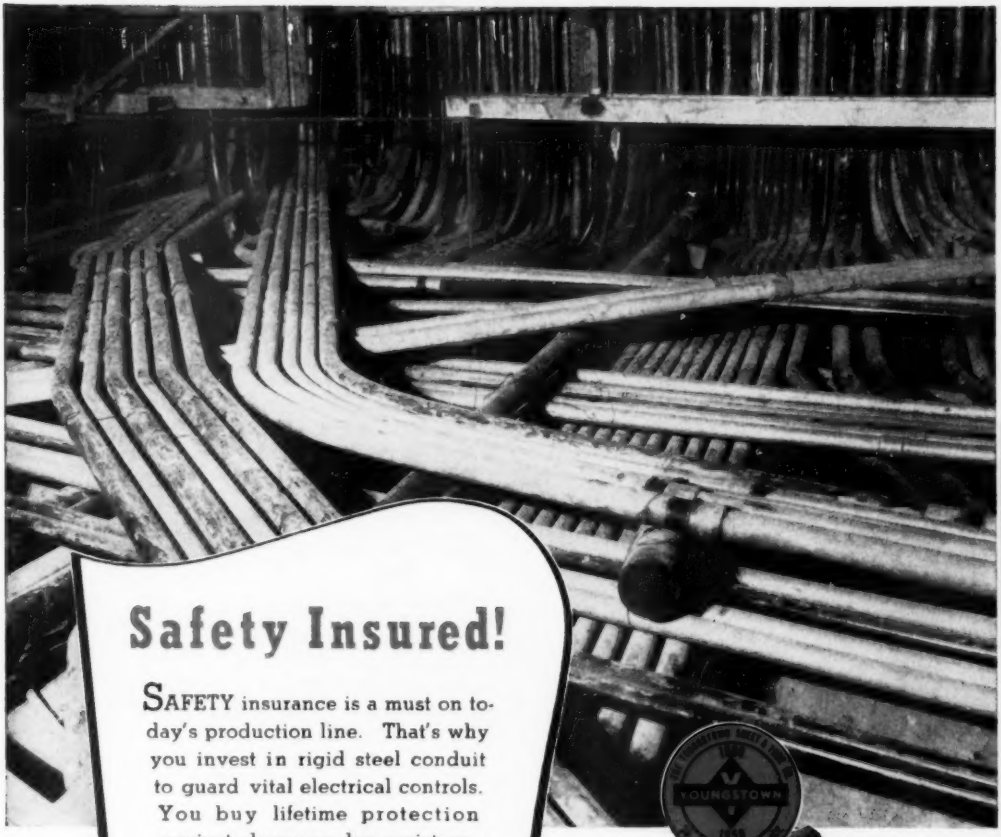
Distributed Exclusively Through Electrical Wholesalers

MADE BY SPECIALISTS IN "SKILLED LIGHTING" EQUIPMENT SINCE 1881

CALL GRAYBAR FIRST FOR . . .

GRAYBAR Everything Electrical

FOR SAFETY'S SAKE . . . USE CONDUIT *(Full Weight Rigid Steel)*



Safety Insured!

SAFETY insurance is a must on today's production line. That's why you invest in rigid steel conduit to guard vital electrical controls. You buy lifetime protection against damage by moisture, vapors, dust, vibration, shock and explosion. When you specify Buckeye you specify safety.

Youngstown

BUCKEYE CONDUIT

THE YOUNGSTOWN SHEET AND TUBE COMPANY

Manufacturers of Carbon, Alloy and Yoloy Steel

General Offices — Youngstown 1, Ohio

Export Office - 500 Fifth Avenue, New York

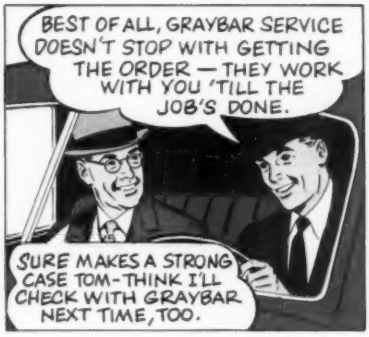
CONDUIT · HOT AND COLD FINISHED CARBON AND ALLOY BARS · PIPE AND TUBULAR PRODUCTS · WIRE · ELECTROLYTIC TIN PLATE · COKE TIN PLATE · RODS · SHEETS · PLATES · RAILROAD TRACK SPIKES.

CALL GRAYBAR FIRST FOR . . . Everything Electrical

SAY, TOM, YOUR JOBS SEEM TO RUN SO SMOOTHLY—
WHAT'S THE SECRET?
NEW HOME OF BROWN MFG. CO.
STARR
ELECTRICAL CONTRACTORS
SIMPLE, JIM, I JUST MAKE THE MOST OF THE EXTRA HELP ANYONE CAN GET FROM GRAYBAR. I'M ON MY WAY THERE NOW— WHY NOT COME ALONG!
Tom Starr Prop

WHEN A JOB BREAKS, I CAN GET PRICES AND "SPECS" ON EVERYTHING ELECTRICAL RIGHT HERE.
CATALOG AND QUOTATION SECTION
HMM... MUST BE A BIG HELP MAKING UP BIDS!

...AND LATER, TOO, BECAUSE YOU CAN LIST EVERYTHING YOU NEED ON A SINGLE ORDER AND, IF YOU DO RUN SHORT, THERE'S ALWAYS THIS HANDY COUNTER SERVICE FOR EMERGENCIES.


BEST OF ALL, GRAYBAR SERVICE DOESN'T STOP WITH GETTING THE ORDER — THEY WORK WITH YOU 'TILL THE JOB'S DONE.
SURE MAKES A STRONG CASE TOM- THINK I'LL CHECK WITH GRAYBAR NEXT TIME, TOO.

THAT'S SOUND REASONING ANYTIME - MAKE IT A POINT TO CALL GRAYBAR FIRST FOR EVERYTHING ELECTRICAL. CHECK THIS LIST, FOR THE GRAYBAR OFFICE NEAREST YOU!

ALABAMA
Birmingham
Mobile
ARIZONA
Phoenix
ARKANSAS
Little Rock
CALIFORNIA
Fresno
Long Beach
Los Angeles
Oakland
Sacramento
San Diego
San Francisco
COLORADO
Denver
CONNECTICUT
New Haven
West Hartford
DELAWARE
Wilmington
DISTRICT OF COLUMBIA
Washington
FLORIDA
Jacksonville
Miami
Orlando
Tampa
GEORGIA
Atlanta
Savannah
IDAHO
Boise
ILLINOIS
Chicago
Peoria
INDIANA
Evansville
Hammond
Indianapolis
IOWA
Davenport
Des Moines
KANSAS
Wichita
KENTUCKY
Louisville
Paducah
LOUISIANA
Baton Rouge
New Orleans
Shreveport
MAINE
Portland
MARYLAND
Baltimore
MASSACHUSETTS
Boston
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Worcester
MICHIGAN
Detroit
Flint
Grand Rapids
Lansing
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MONTANA
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NEW HAMPSHIRE
Manchester
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Newark
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Rochester
Syracuse
NORTH CAROLINA
Asheville
Charlotte
Durham
Winston-Salem
OHIO
Akron
Cincinnati
Cleveland
Columbus
Dayton
Toledo
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Harrisburg
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Pittsburgh
Reading
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Columbia
SOUTH DAKOTA
Aberdeen
TENNESSEE
Bristol
Chattanooga
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Memphis
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TEXAS
Amarillo
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Beaumont
Corpus Christi
Dallas
El Paso
Ft. Worth
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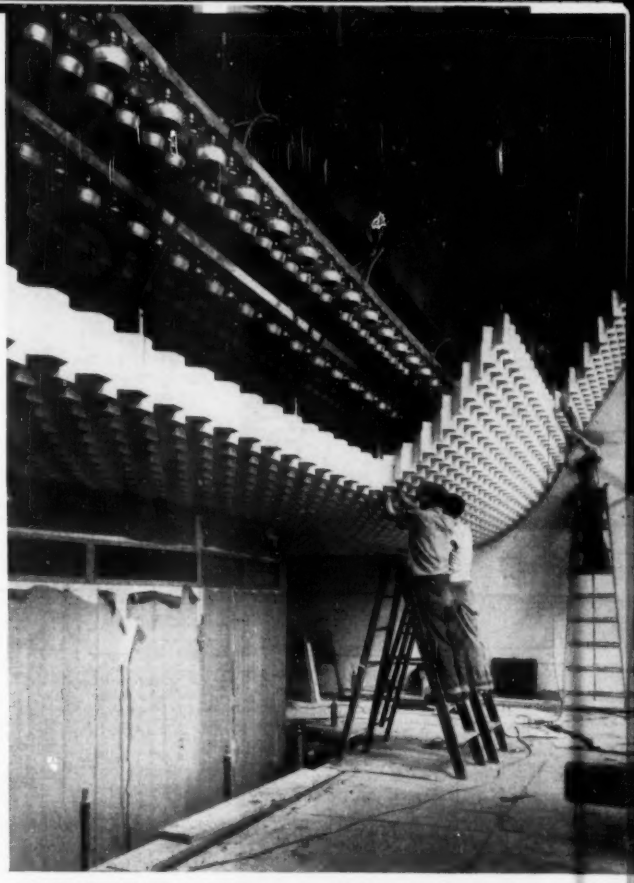
New Frontiers for Mobile Color Lighting

New application techniques for mobile color lighting, with automatic operation of unlimited preset combinations of harmonizing colors, provide unique lobby lighting and identification for the 383-385 Madison Avenue Building, New York City.



CURVED HEXCRATE CEILING is suspended below banks of reflector light strips (shown during installation). Banks of four 5-foot long light strips, with 40 150-watt PAR-38 lamps in four colors, light each 5-foot 2-in square ceiling section.

By Berlon C. Cooper

A dramatic and spectacular installation of mobile color lighting is attracting the attention of all passers-by to an office building lobby in New York City. It not only lights the lobby and entrance, but also identifies the building location and advertises the office buildings served by the lobby. That is exactly what Webb & Knapp, Inc., architects intended.

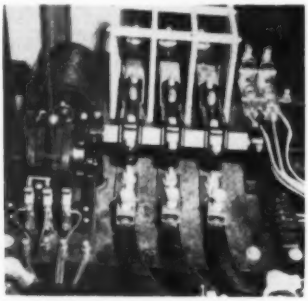
This mobile color lighting system is the dominant feature of the remodeled twin lobbies of two adjoining office buildings, now nearly 30 years old. The new lobby uses a 3-story-high paneled glass front, behind which is a sloped curving cellular "hexcrate" ceiling spanning across the original two-lobby space. The new lobby unifies the two newly-renovated identical office buildings, effectively advertises the modernization. Thus light and architecture are harmoniously blended into aesthetic and utilitarian design, economically justify the $500,000 lobby modernization cost. The color lighting system and ceiling cost $125,000.

While mobile color lighting is not new, this lobby lighting installation is the first of its kind. It is done on a grand and elaborate scale. Also, it operates automatically, contains new concepts of color control, combines only colors which harmonize, provides an unlimited range of color combinations, patterns and designs. These refinements are effected by Rollocolor, trade name for a system of complex color controls and circuit arrangements which makes selection of a pleasing color or pattern of colors as simple as tuning in a radio.

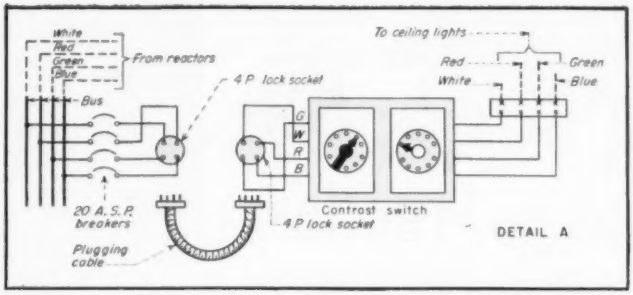
The cellular ceiling curves downward from the top of the lobby glass front to the elevator lobby ceiling level, and then extends to the rear of the lobby at a height of 15 feet 6 inches from the floor. Individual cells are formed of aluminum, hexagon shaped, six inches across and six inches deep. Individual cells are closed on top by lightly etched Plexiglas panels lined in one direction to provide partial diffusion. Curved portion of this ceiling, which faces out onto the street, is divided into 48 electrical unit areas each 5-feet 2-inches square to permit a variety of color patterns. Flat portion of the ceiling extending to the rear of the lobby from the bottom side of the curved area is lighted with cool white fluorescent slimline lamps to an intensity of 40 footcandles.

Above the cellular ceiling are reflector light strips, each five feet long, each equipped with ten 150-watt PAR-

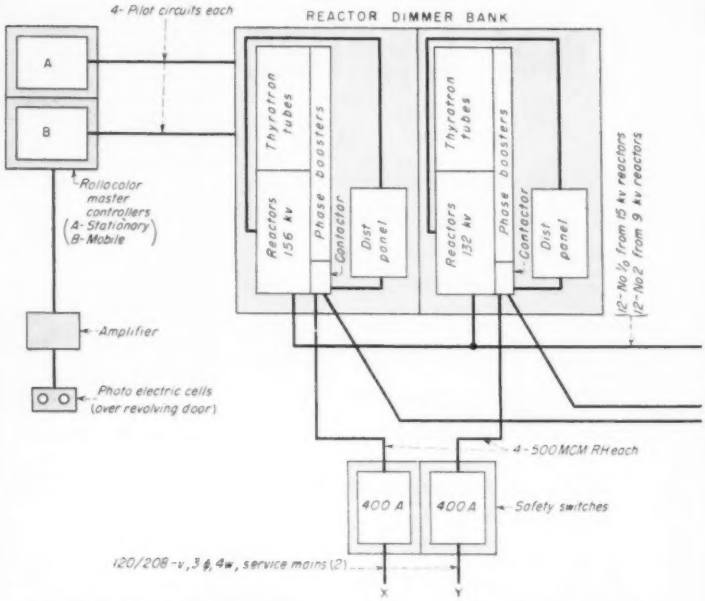
PILOT VIEWING PANEL, miniature of 48-section Hexcrate ceiling, shows Red Cross pattern on ceiling being checked by Rollo G. Williams, Rollocolor inventor.



CONTACTOR for each dimmer bank is rated 400-amp., 3-phase, 3-wire.



WIRING DETAIL showing hookup of one color contrast switch which permits selection of different harmonizing colors for one ceiling unit area. Plugging cable connects contrast switch to any reactor bank as desired.



AUTOMATIC CONTROL FEATURES and power flow diagram which illustrate new achievements of technological progress in mobile color lighting.

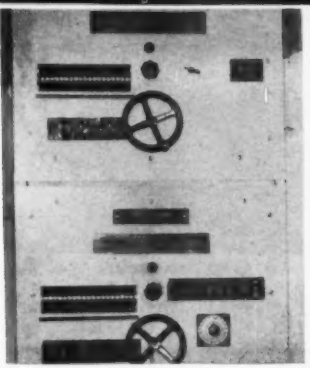
38 reflector lamps. Each light strip is wired for two colors, 750 watts per color. Total load per ceiling unit area is therefore 6,000 watts, or 1500 watts per color. Total lamp load is 288,000 watts, over an area of 1220 square feet of lobby floor space. Colors used are red, blue, green and white (clear). Color roundels clipped on reflector lamps provide the colors.

Third element of this lighting system is the variable voltage system, and its complex array of components which ultimately regulates the voltage across each lamp and varies the intensity of each color.

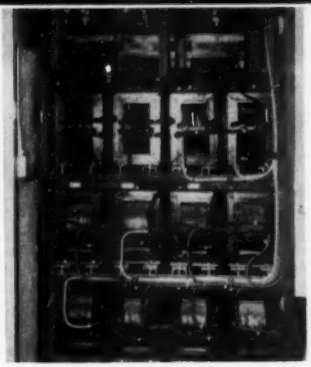
The new concepts of color control used in this color lighting system add the features which make it truly spectacular and insure its automatic operation according to any preset schedule. These controls are the inherent features of the Rollocolor control system, designed and patented by Rollo G. Williams, an Englishman with 30 years' experience in the field of theatre and display color lighting.

The control system operates on the principle of four color circuits. A total of 24 reactors are required for the 288-kw. load in this lobby lighting system—12 15-kw. reactors, and 12 9-kw. reactors. So these 24 reactors are banked in six groups each to provide a basic four-reactor four-color system. Either of the two master controllers provides for a constant pattern of color, or for changing color patterns of light. The controllers each operate four variable potentiometers which in turn regulate the operation of the electronic tubes and thereby the flow of dc current into the reactors to provide the required variable voltage.

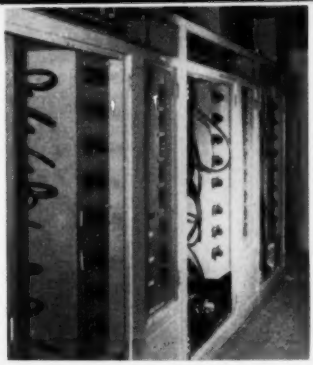
Another control feature is the 17-foo long color contrast panel containing 48 contrast switches. These 18-position switches permit different unit



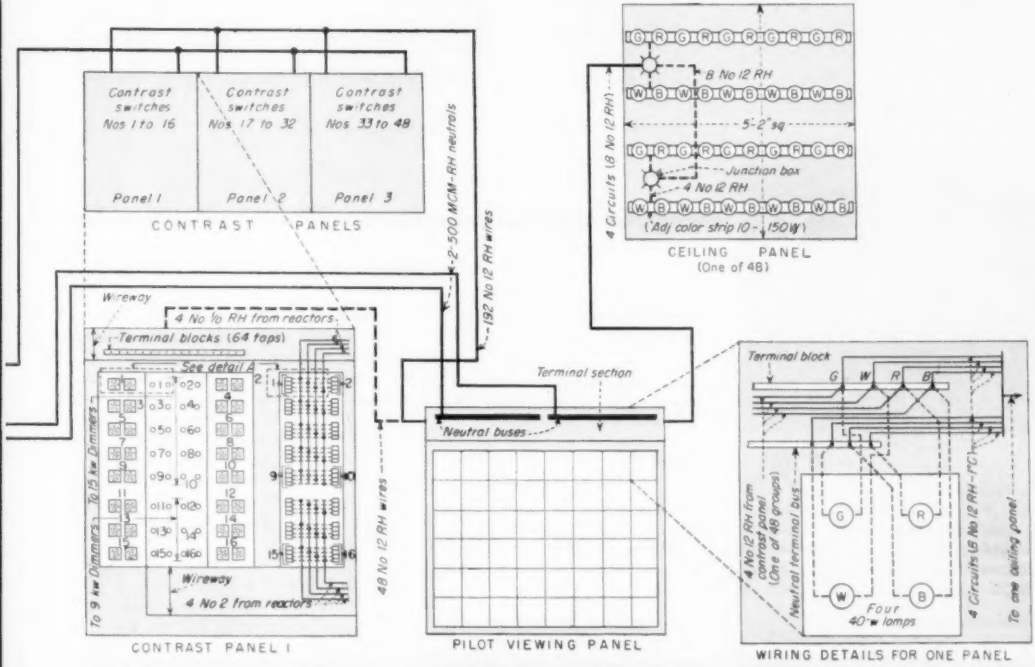
MASTER BRAIN of the automatic mobile color lighting system is two Rollocolor master controllers.

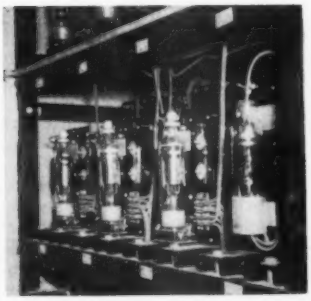


REACTORS are in two banks (one shown), with 12 reactors per bank. These regulate voltages across the color circuits.

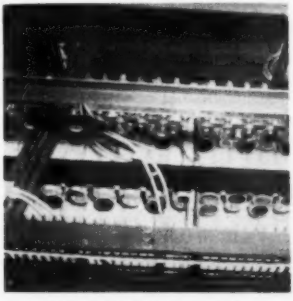


CONTRAST PANEL contains 48 contrast switches, used to select harmonizing colors in different ceiling unit areas.

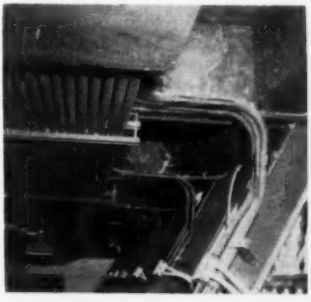




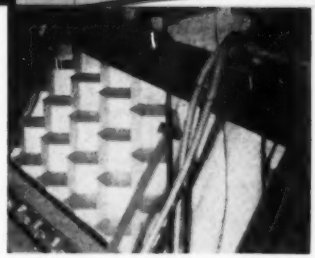
ELECTRON TUBES are banked in same framework with reactors, on opposite side, are controlled by Rollo-color units.



STEEL FRAMEWORK supports Hexcrate ceiling, reflector strips (seen from below), conduit and cable and three catwalks.

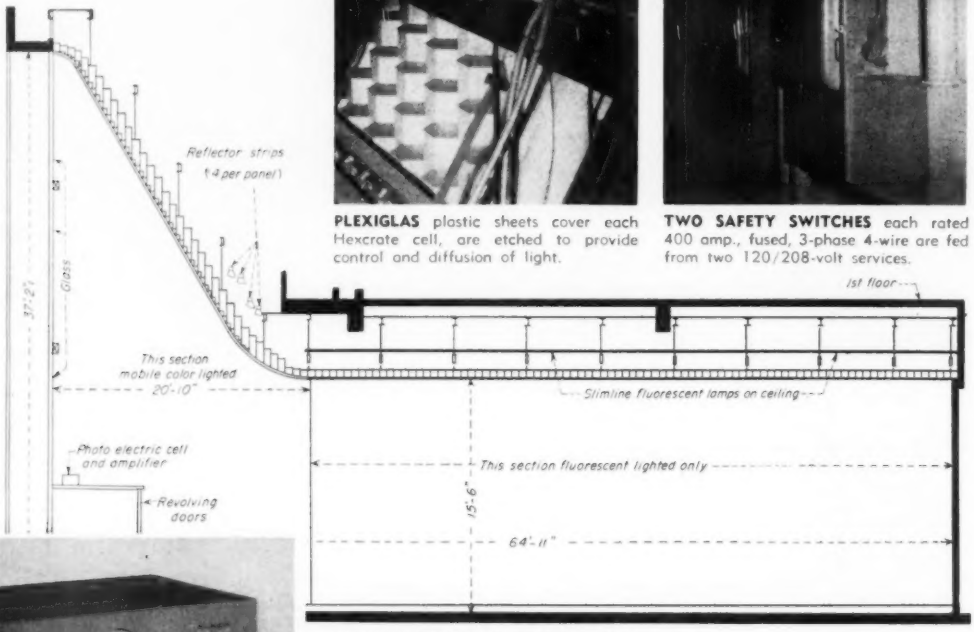


CONDUITS racked on ceiling each contain 8 No. 12 RH wires (4 circuits) for each of the 48 ceiling sections.

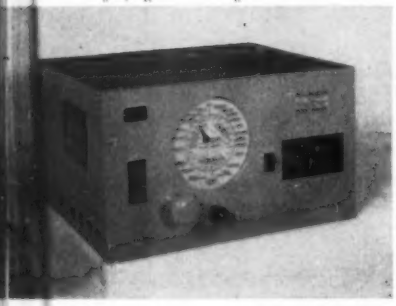


PLEXIGLAS plastic sheets cover each Hexcrate cell, are etched to provide control and diffusion of light.

TWO SAFETY SWITCHES each rated 400 amp., fused, 3-phase 4-wire are fed from two 120/208-volt services.



CURVING CELLULAR CEILING with Hexcrate honey-comb cells provides effective and unique medium for display of dramatic mobile color combinations.



ROLLOCOLOR CONTROL UNITS range from small, low cost types to elaborate multiple-unit systems. Manually-operated type shown (left) controls four 1,000-watt color circuits, contains breakers for line feeds and load circuits.

NEW MARKET AHEAD

Mobile color lighting offers a vast new market, practically untouched, for electrical contractors or others willing to promote it. Every show window on every Main Street is a prospect. It can also be applied to monumental and display floodlighting, to theatres, to stage lighting, to auditoriums, to public and private color-lighted fountains, and to many other fields.

Mobile color lighting can be done inexpensively, as for example, for a show window. Controls for a basic four-color installation with four 10 amp. circuits begin at about $200. The Rollocolor unit shown above is a typical small controller which will create up to 500 different color combinations of harmonizing dramatic beauty.

Mobile color lighting is not new. It was popular in this country in the late 1920s. Its popularity waned for two principal reasons: the depression of the early 1930s forced economic retrenchment; and control devices which would insure color harmony in the various selections of colors had not been perfected. Only the lighting engineer who designed a mobile color lighting installation could operate it effectively, and it was difficult to train others to get the maximum benefit out of the installation. These two reasons no longer exist. The nation is no longer in a depression, and automatic or manual controls are now available which insure proper color harmony and easy selection of any desired color lighting effect.

Mobile color lighting should now be easy to sell. Many outstanding installations have already been made during the past three years. The market exists, the tools are available, and the demand can be created. New frontiers for mobile color lighting are now in the making.

areas to be lighted in different harmonizing colors, which gives the system its extraordinary flexibility. The number of arrangements of color which can be produced because of this feature is reported to be a mathematical sum of seven followed by 43 zeros.

A photoelectric cell installed over one of the revolving doors in the lobby changes the chromatic value of the color lighting through the master controllers.

Since the control room is located remotely from the lobby ceiling, a pilot viewing panel, miniature of lobby ceiling, is provided to aid the operator when setting up new color patterns.

Once a color pattern is set, two dials on the master controller are the only controls needed by the operator. To reproduce exactly a color once used, the operator simply "tunes" to position.

Credit for the lobby design belongs to Paxton, Krueger & Associates, Inc., in association with Norman Bel Geddes. Webb & Knapp, Inc., were the architects, and Smith & Silverman were the electrical engineers. Electrical work was done by David Coyne & Co., Inc., and Rollo G. Williams, inventor of Rollocolor, planned the lighting. All Rollocolor controls and equipment were furnished by the Color Lighting Corporation.

Merit Award Entries
REVEAL LIGHTING PROGRESS

Contractors, consulting and plant engineers actively participate in NEMA's 1952 Merit Award Competition. Entries cover many types of lighting systems, indicate higher lighting standards have been set. Five major important trends in lighting are:

1. ***New lighting techniques have been established.***
2. ***Lighting system designs are improved.***
3. ***Better quality lighting is being sold.***
4. ***Better maintenance features are being used.***
5. ***Higher distribution voltages are being adopted.***

LIGHTING progress is in the making. This is true throughout America and in Canada. New lighting standards have been set. These standards now reach out into all communities, large and small. And the pace is quickening. New lighting ideas and lighting techniques are being tried out, many times in the smallest towns and cities. This all contributes to the continued success of the lighting industry in providing more and better quality lighting for those who live, work and play under artificial light. And it continues to establish new and fresh lighting frontiers, and an ever-widening market for better lighting.

This lighting progress is spectacularly demonstrated in the 287 prize winning entries in the 1952 Merit Award Competition, submitted by 409 winning contestants. These winning entries will be displayed in the Court of Honor in the Exposition Hall of the Cleveland Auditorium May 6 to May 9, 1952, at the Fourth International Lighting Exposition and Conference. This four-day Exposition is sponsored by the Industrial and Commercial Lighting Equipment Section of the National Electrical Manufacturers Association. Gold Seal and Merit Award winners will receive their awards at a special conference session at 2:00 p.m. on May 7th at the Cleveland Auditorium.

A preview of the Merit Award entries indicates five major and important trends in lighting, which are briefly outlined here.

1. New lighting techniques have been established.

These include luminous ceilings of plastic and glass, the combining of light and sound systems as a packaged unit, and improvements in industrial lighting. An industrial lighting trend is toward a better visual environment—ceilings, walls, floors and machinery finished in lighter non-glossy colors and finishes, and reflectors open at the top to provide an upward light component to softly illuminate overhead ceiling areas.

2. Lighting system designs are improved.

Large-area luminous elements, and geometric or functional patterns of lighting equipment are being used intelligently to conform with architectural design and decorative treatment. Luminaire and equipment selection is more logical, and better quality lighting is being provided through judicious selection and combination of light sources.

3. Better quality lighting is being sold.

Areas to be illuminated are being "light-conditioned," to provide a better visual environment. Interior building surfaces are being painted in lighter colors having higher reflection factors, and furniture and furnishings are being finished in lighter colors with non-gloss surfaces. Combined with shielded, low-brightness lighting systems, a much improved lighting quality results.

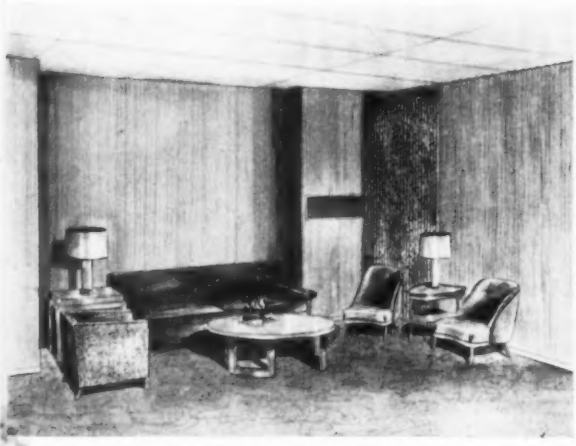
4. Better maintenance features are being used.

Manufacturers are incorporating more features in their equipment designs to make maintenance simple and easy, and lighting engineers are specifying more maintenance devices, such as catwalks, disconnect hangers, and other equipment to provide easy access to lighting equipment for cleaning and relamping.

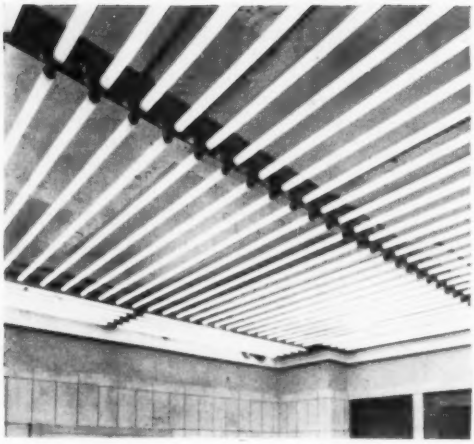
5. Higher distribution voltages are being adopted.

Wiring economies and lower ballast costs are being effected through greater use of higher distribution voltages, such as the 480/277-volt system and four-lamp ballasts for 85-watt T17 fluorescent lamps. There is also an increasing rate of use of slimline lamps, especially in the 8-foot lengths.

For our selection of typical Contractor and Engineer entries, turn the page →



LUMINOUS CEILING LIGHTING provides over 300 footcandles in observation room of a neuro hospital.



SLIMLINE LAMPS on 6-inch centers are installed ladder-style on CurtiStrip, and ballasts remotely located.

Lighting for a Psychiatric Hospital

ENTRY NO. 420

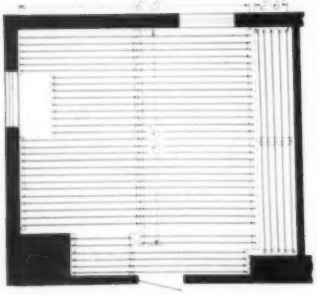
ELECTRICAL CONTRACTOR: H. H. Lundberg
Wadeford Electric Company
Chicago, Illinois

SINGLE ENTRY

PROBLEM—To produce, without discomfort to room occupants, sufficient vertical and horizontal illumination to permit facial and physical expressions to be photographed on Kodachrome 16 mm film. The room involved is a dual purpose room, furnished as a recreational lounge for the study of groups, as well as for consultation between doctors and patients.

Lenses of automatically-operated cameras are camouflaged behind three openings in one wall. Room furnishings are arranged to permit occupants from moving out of camera range.

SOLUTION—A lighting system was selected which would provide a high level of horizontal illumination as well as enough vertical illumination to permit occupants to be photographed successfully. The system was a luminous-paneled ceiling extending from wall to wall, with deluxe cool white fluorescent lamps spaced 6 inches on centers in the cavity above the ceiling. Lamp sockets were installed in mogul CurtiStrip wiring channel, and all operating equipment located in an adjoining room to eliminate ballast hum. Supplemental lighting was provided by floor and table lamps to provide highlights and shadows. The corridor approach to this room was lighted to 60 footcandles to permit eye accommodation of persons entering this brightly lighted room. Cross ventilation within the cavity above the ceiling is thermostatically controlled to prevent undue temperature rise within the room below.

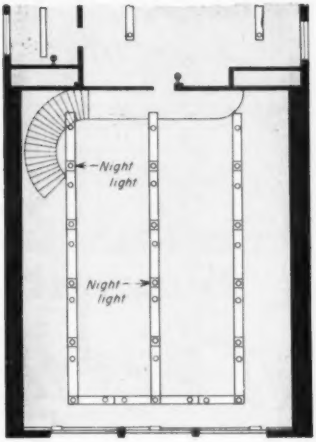


LIGHTING RESULTS

HORIZONTAL FOOTCANDLES	
Center area	310
Side walls	220-240
Corners	150
VERTICAL FOOTCANDLES	
On face of person seated on settee	130

BRIGHTNESS READINGS IN FOOTLAMBERTS	
Ceiling (corrugated plastic)	550
Large wall areas (light green)	95
Camera concealing panel (figured light green)	95
Floor covering (patterned light green)	44
Settee (light brown)	24
Corner drape panels (green with red mottling)	32
Chairs (light green)	38

An Appliance Display Room



COMBINATION FLUORESCENT and incandescent luminaires provide good quality illumination for lighting appliance displays.

ENTRY NO. 548

ELECTRICAL CONTRACTOR: E. L. Bailey
City Electric Company
Albuquerque, New Mexico

SINGLE ENTRY

PROBLEM—Provide minimum of 50 footcandles of general illumination with low brightness features, and accent lighting for pin-point display after closing hours. Ceiling height—17 feet.

SOLUTION—Three continuous rows of four-lamp slimline fluorescent luminaires with adjustable accent spots installed between the 8-foot units were surface installed on the ceiling. Similar luminaires each 12-feet long were installed across one end of the room to connect the three long parallel rows. Luminaires are DayBrite No. 97400-8 in the long parallel rows, No. 97400-6 (2 units in tandem) between rows at the end, and DayBrite No. 80165 adjustable accent units. All slimline fluorescent lamps are operated at 430 ma. Accent lights are 300 watt R-40 spots.

Average lighting intensity without accent lights is 58 footcandles.

Luminous Ceiling in an Executive Office

ENTRY NO. 244-D

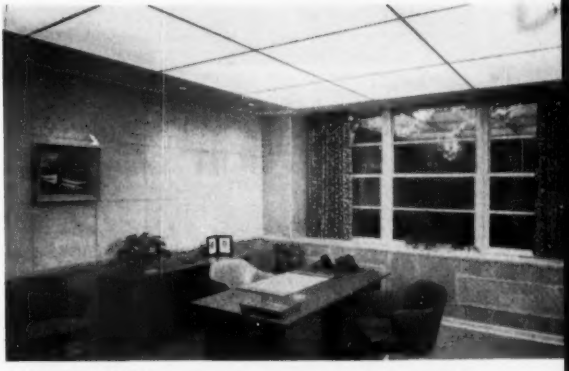
ELECTRICAL CONTRACTOR: L. Kestenholtz
Lansing Electric Motors
Lansing, Michigan

SINGLE ENTRY

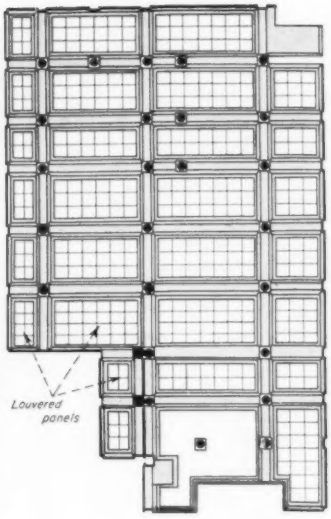
A luminous ceiling formed with 4-foot square coffer panels of white translucent Plexiglas acrylic plastic provides diffused lighting and an attractive appearance in this private office. Slimline lamps operated at 200 ma. and mounted 24 inches above the coffers on 18-inch centers are installed in DayBrite No. 99165 single strips with symmetric porcelain enameled reflectors run in continuous rows.

The coffers, a reverse pyramid design, are Plexiglas No. 122-75, formed by Cadillac Plastics, Detroit. They are supported by aluminum T-bars.

Average illumination is 48 footcandles. Walls are light finished paneling, with reflectance of 20% average.



COFFER PANELS form attractive luminous ceiling and provide 48 footcandles of illumination in private office of Auto-Owners Insurance Co., Lansing, Michigan.



MODERN LIGHTING skillfully integrated into the classic design of this bank interior provides good seeing and enhances the architectural treatment.

Relighting a Traditional Bank

ENTRY NO. 489
CONSULTING ENGINEER: H. A. Delius
Delius & Thomas Engineers
San Francisco, California

SINGLE ENTRY

PROBLEM—To relight the main banking area of this bank of traditional design in such a manner as to preserve and enhance the architectural details, and to provide ample illumination of comfortable quality for employees and customers.

SOLUTION—Existing suspended ornamental luminaires were removed. The existing ceiling was replaced by louver module panels, above which were installed fluorescent strip lights equipped with slimline lamps. The result is a uniformly lighted interior, with illumination diffused throughout the area, creating a pleasing impression of restful spaciousness and cheeriness—an important factor for a bank in developing good public relations. Design details of the interior are now clearly featured.

INSTALLATION DETAILS

EQUIPMENT:
Removable ceiling panels are aluminum, egg-crate design with 2-in. x 2-in. x 2-in. cells, No. 1244-20, manufactured by Cepco, Inc., San Francisco, supported in 4-foot square steel frames. Louvers and frames are finished off-white baked enamel.

STRIP LIGHTS:
Sylvania No. C-80 and No. C-150 installed at 45-degree angle to panels, using dualamp instant start ballasts.

SLIMLINE LAMPS:
Cool white single-pin F96T-12/CW operated at 425 ma., and F48T12/CW operated at 420 ma.

ILLUMINATION:
Intensity—50 footcandles average.

BRIGHTNESS (IN FOOTLAMBERTS):

Task	33
Working plane	20
Walls (midway to ceiling)	23
Floor	24
Louverall Ceiling	30

BRIGHTNESS RATIO:

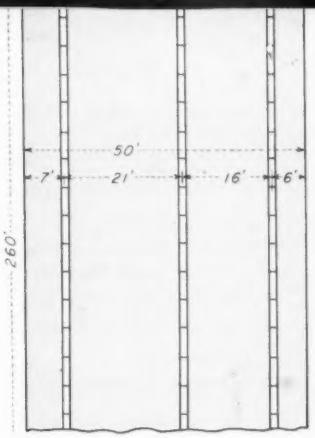
Maximum	1.625 to 1
Minimum	1.083 to 1

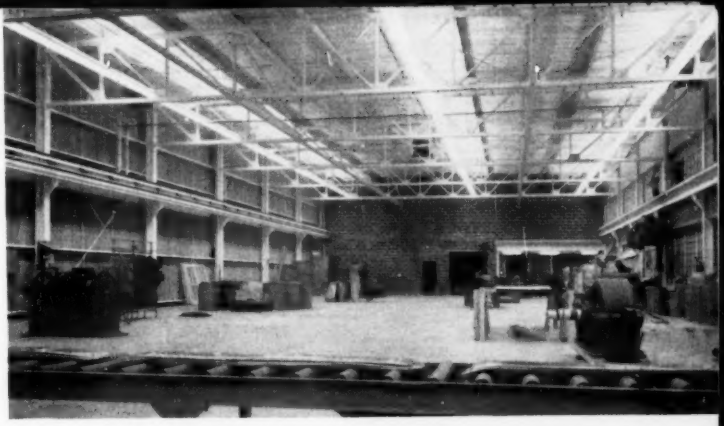
High Bay Area Lighting

ENTRY NO. 290
PLANT ENGINEER: George E. Pieper
Metals & Controls Corporation
Attleboro, Mass.
JOINT ENTRY WITH—
ELECTRICAL CONTRACTOR: Represented by
William T. Metters
Metters Electric Co., Inc.
Attleboro, Mass.
ELECTRICAL WHOLESALER: Donald Somes
Graybar Electric Co.
Providence, R. I.

In this 50-foot by 260-foot high bay area the ceiling height is 24 feet. The equipment is large and the visual tasks are not critical. The ceiling is supported by steel girders with vertical struts.

Three continuous rows of Curtis No. 3526-DLH-SP fluorescent luminaires with cross louvers were mounted 21 feet from the floor to light this area. One outer row is 6 feet from the wall, the other outer row is 7 feet from the wall, and the center row is 3 feet off center of the area—due to vertical struts at mounting position above the bottom





SEEING IS EASY in this light-conditioned high bay area at Metals & Controls Corporation, Attleboro, Mass. Direct-indirect luminaires provide 30 footcandles of high quality lighting.

girder. Luminaires were mounted in this position to avoid a traveling crane. Lamps are 85-watt T-17 standard cool white. Four-lamp ballasts, General Electric No. 59G9601, 236-volt primary, are used—one per 10-foot section of luminaire. Unistrut was used to support the luminaires.

These luminaires are of the direct-indirect type, with 40% upward component. The ceiling and all structural members overhead are painted white. Side walls and floor are also finished in a light color. Machines are finished in blue.

The maintained lighting intensity is 30 footcandles. With a load of approximately two watts per square foot, this results in an illumination level for this high bay area of 15 footcandles per watt per square foot, maintained in service.

Lighting a Football Stadium

ENTRY NO. 217
CONSULTING ENGINEERS: Lockwood & Andrews, Houston, Texas

JOINT ENTRY WITH ELECTRICAL CONTRACTOR: Represented by C. J. Rollo, Electrical Dept. Brown & Root Company

ELECTRICAL UTILITY: H. G. Hrivnatz, Houston Lighting & Power Co.

ARCHITECTS: Lloyd & Morgan and Milton McGinty

OWNERS AND USERS: Rice Institute (all of Houston, Texas)

FLOODLIGHTING provides easy seeing for spectators and players for night games in the Rice Institute Stadium, Houston, Texas.

Completed late in 1950, the Rice Institute Stadium has a seating capacity of 70,000. It is lighted to an intensity of 74 footcandles at the center of the playing field, and to 58 footcandles at the side lines. These illumination values are adequate for easy seeing by spectators and players, and the lighting is comfortable for all spectators regardless of seat location.

Floodlight Installation Details

Floodlights are General Electric Company Type L-69 special, equipped with 1500 watt G-48/6 110-volt 30,000-lumen lamps. A total of 384 floodlights are used to light the playing field, and 20 floodlights light the parking area. The stadium floodlights are mounted on 16 standards, 24 units per standard. Floodlight banks are 171 feet above grade level, and 46 feet apart except for two center banks on each side of the field which are 23 feet apart.

Floodlights have a beam efficiency of 32.3%, with 7,000 beam lumens. Beam spread is 13.8 degrees horizontally, 12.4 degrees vertically. Maximum candlepower is 772,000.

The floodlight standards were furnished by the Elreco Corporation. Ten are 60 feet high each, installed at the top rear of the stadium, and six are 40 feet high each, installed above the covered section of the stands.

The system voltage is 12,000/120/208 volts. The measured load demand is 855 kva.

LOW BRIGHTNESS LENS troffers, and light finished ceilings, walls, floors, furniture and machines, combine to provide comfortable lighting and an ideal visual environment.

ENTRY NO. 279

ELECTRICAL CONTRACTOR: George W. Miller
Commonwealth Electric Company
St. Paul, Minnesota

JOINT ENTRY WITH—
ELECTRICAL WHOLESALER: Represented by
Robert V. Mealey and Al Natalie
General Electric Supply Corp.
St. Paul, Minnesota

ARCHITECT: Hoyt R. Cass
Ellerbe & Co.
St. Paul, Minnesota

OWNER & USER: Rudolph Raitor
Minnesota Mining & Manufacturing Co
St. Paul, Minnesota

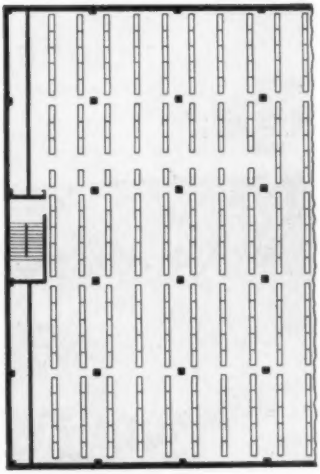
Lens Troffers for a Modern Office

Brightness Values in Footlamberts

LUMINAIRE:	
Lengthwise	210-266
Crosswise	109-128
CEILING:	
Adjacent to luminaires	8
Midway between luminaires	6
WALL:	
Upper	14
Lower	10
OFFICE MACHINES:	7-10
WHITE PAPER (used in IBM):	35
FLOOR:	
At edge of room	8
Midway between luminaires	11
Directly under luminaires	13

Recessed troffers equipped with prismatic glass lenses light this machine records general office area to an average intensity of 63 footcandles. All units are wired for 3/40-watt lamps per 4-foot section, but are equipped with two lamps to provide the above lighting intensity. The continuous rows adjacent to the false wall are equipped with three lamps per unit and provides 68 footcandles in this area. Two-foot breaks in continuous rows are for future wall partitions.

Low brightness prismatic glass lenses provide excellent brightness control. Finishes of ceilings, walls, floors, desks, tables and office equipment are in light colors with appropriate reflection factors for an ideal visual environment. These factors combine in fulfilling the important office lighting requirements of quantity, quality, control, distribution and general appearances.



Relighting Without Structural Changes

ENTRY NO. 322

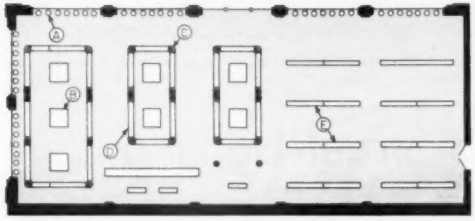
ELECTRICAL CONTRACTOR: Melvin Gordon
Albert Lea, Minnesota

JOINT ENTRY WITH—
ELECTRICAL UTILITY: Represented by
George H. Simpson
Interstate Power Company
Albert Lea, Minnesota

PROBLEM—To remodel and relight a sales floor without making any structural building changes in a 30-year old building; to relate the new lighting system to the interior room design; and to provide brilliance and sparkle to merchandise displays. The existing ceiling height was 18 feet, and because of financial restrictions the ceiling could not be lowered.

SOLUTION—A combination of fluorescent and incandescent lighting equipment for surface suspension installation was selected. The fluorescent equipment was laid out to conform to ceiling bay construction, and to take advantage of natural shielding afforded by deep beams.

In three bays with high ceiling DayBrite Plexoline luminaires were suspended in rectangular pattern, with accent lights at corners and between 8-foot sections. Within the rectangles 4-foot square surface mounted DayBrite units were installed. Twin-spot window lights were installed on the ceiling along all windows. In the two rear bays with lower ceiling height Smithcraft "Mercury" slimline luminaires were suspended at same height from floor as the fluorescent units in the other three bays.



FLUORESCENT LUMINAIRES provide general diffuse lighting in this sales room, and incandescent spots add sparkle and brilliance to the displays.

LIGHTING EQUIPMENT

Type A — Ruby-Philite twin spot window lights
Type B — DayBrite No. 44810 4 x 4 luminaires
Type C — DayBrite No. 80160 Plexoline accent units
Type D — DayBrite No. 97201-8 Plexoline luminaires
Type E — Smithcraft "Mercury" 8-foot luminaires

ILLUMINATION

With fluorescent only — 75 footcandles average
Under spotlights — 120-162 footcandles

BRIGHTNESSES

Range from 16 footlamberts on ceiling at walls to 300 footlamberts on side of Plexoline luminaires at lowest angle.

Lighting a Library Reference Room

ENTRY NO. 530

CONSULTING ENGINEER: L. Ralph Bush
Atlanta, Georgia

SINGLE ENTRY

The reference room in this library is 48 ft. by 78 ft., with a high ceiling broken up by deep beams. The problem was to provide a high level of general illumination suitable for locating reference material easily and for comfortable reading.

A troffer lighting system was selected, in which the troffers were arranged in a rectangular pattern in each bay. Square ceiling panels were used, in which an acoustical ceiling was installed within the troffer rectangles. The entire ceiling panel was installed below the deep beams to create an apparent lower ceiling and to conceal the deep beams as much as possible.

Troffers in each bay contain 16 40-watt fluorescent lamps, and four 150 watt incandescent lamps, above prismatic glass lenses installed at each corner of the troffer rectangle. Troffers are DayBrite No. 42235, and corner lens units are DayBrite No. 80127-CE.

The lighting intensity is 56 footcandles average, maintained in service. Brightness readings range from 17 footlamberts on the floor and walls to 550 footlamberts on the fluorescent luminaires. Brightness of the incandescent lens unit is 470 footlamberts.

RECESSED TROFFERS in geometric pattern provide 56 footcandles average in this library reference room, create interesting architectural treatment, conceal heavy ceiling beams.

ENTRY NO 214

ELECTRICAL CONTRACTOR: George W. Miller
Commonwealth
Electric Company
St. Paul, Minnesota

JOINT ENTRY WITH—
ELECTRIC UTILITY: Represented by—
A. H. McKillop
Northern States
Power Company
St. Paul, Minnesota

ARCHITECT: Hoyt R. Cass
Ellerbe & Co.
St. Paul, Minnesota

OWNER AND USER: H. C. Streich
Bureau of Street
Planning
City of St. Paul,
Minnesota

SOLUTION: Wall-mounted 750 watt lens units were installed on building fronts on both sides of street, 26 feet above sidewalk and 75 feet apart.

A New Approach to Street Lighting

PROBLEM—To relight seven blocks of a main business street in St. Paul, Minnesota, without the use of ornamental street lighting standards. To provide a lighting result equal to or better than present day practice on the street and sidewalks. To eliminate both direct and reflected glare.

Each city block is approximately 300 feet long, and the street is 60 feet wide from building line to building line.

SOLUTION—Special wall mounting units using Holophane No. 4220 compound refracting lenses in General Electric Form No. 111 fixture bodies were installed 26 feet above street level on the building fronts on both sides of the street. Spacings were 75 feet apart, non-staggered. Each unit was equipped with a 750 watt lamp, and connected to a multiple wiring circuit.

RESULTS—Illumination values vary from 2.15 to 2.35 footcandles on the street, and from 1.40 to 1.53 footcandles on the sidewalk. Both direct and reflected glare are eliminated.

Lighting A Finish Rolling Mill

DIRECT-INDIRECT LIGHTING in this rolling mill department sets a new standard for industrial lighting quality.

ENTRY NO. 287

ELECTRICAL CONTRACTOR: Ernest Precourt
Attleboro, Mass.

JOINT ENTRY WITH—
ELECTRICAL WHOLESALER: Represented by
Donald Somes
Graybar Electric Co.
Providence, R. I.

OWNER & USER: George E. Peiper,
Materials Engineer
Metals & Controls Corporation
Attleboro, Mass.

INSTALLATION: Metals & Controls Corporation
Attleboro, Mass.

Highly polished metal is rolled in this finish rolling mill department of the Metals & Controls Corporation, Attleboro, Mass. It is necessary to see *all* flaws in the metal as it is rolled, in order to produce a product as nearly perfect as possible. This means that the lighting must be glare free and of high intensity, and that the visual environment be as nearly ideal as possible. The room is 20 feet wide by 60 feet long, with a ceiling height of 8-ft. 6-in. The ceiling is acoustical tile, and the room is air conditioned.

An intensity of 70 footcandles of diffused glareless illumination is provided by four continuous rows of Curtis No. 4060 Alzak aluminum louvered units of the direct-indirect type. These luminaires are installed 5-feet on centers, with a suspension of 6 inches to top of reflectors. The upward light component softly illuminates the ceiling, and provides greater light diffusion. The ceiling is white, upper side walls are light buff, lower side walls are green and the floor is gray. All elements combine to provide a visual environment comparable to that in the best lighted school rooms or offices.

Now Available for All Leader TROFFER UNITS

FOR GREATER ADAPTABILITY AND APPLICATION

Now, the acknowledged versatility of Leader TROFFER Units is further extended by the addition of Leader Moulded Plastic Louvers. These louvers provide 40° horizontal and vertical shielding . . . they swing either way for easy maintenance and relamping . . . they are "destaticized" and guaranteed against warpage and discoloration.

Cash in on this advantage that Leader Troffer offers. A new, expanded market is opened up for you . . . schools, offices, hospitals, banks and other commercial interiors. Write Leader for full details.

Sold and installed by the better electrical dealers and contractors

Leader *America's No. 1 Lighting Equipment Manufacturer*

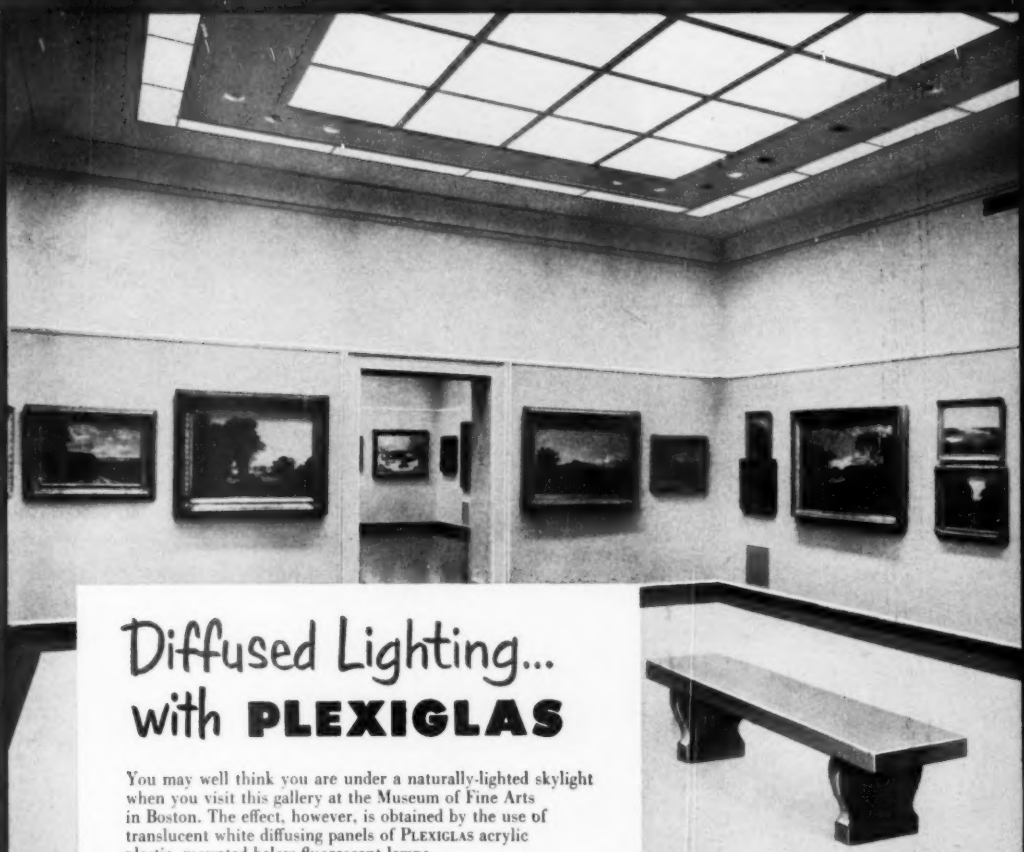
LEADER ELECTRIC COMPANY • 3500 North Kedzie Avenue • Chicago 18, Illinois
Leader Electric—Western: 800 One Hundredth Avenue, Oakland 3, California
Campbell-Leader, Ltd.: Brantford, Ontario • Canada

This seal is to remind you that the biggest lighting event of the year will soon be held in Cleveland. The sketch below is to help you identify the one exhibit at the Lighting Exposition you won't want to miss.

You are most cordially invited to visit the comfortable, colorful Day-Brite product parade — **featuring a complete new Day-Line® industrial line with narrower channel and 10% upward component . . . new, improved Derby Downlights . . . the first showing of new troffer enclosing elements and Plexoline® series with the most advanced shielding and low-brightness qualities.**

By all means, renew or begin your acquaintance with the nation's No. 1 line of lighting fixtures and the people who make them. We'll be mighty happy to have you.

DAY-BRITE LIGHTING, INC. • 5402 BULWER AVE. • ST. LOUIS 7, MO.



Diffused Lighting... with PLEXIGLAS

You may well think you are under a naturally-lighted skylight when you visit this gallery at the Museum of Fine Arts in Boston. The effect, however, is obtained by the use of translucent white diffusing panels of PLEXIGLAS acrylic plastic, mounted below fluorescent lamps.

PLEXIGLAS luminous ceilings provide high quality lighting in eight new exhibition rooms at the Museum. The totally *diffused* illumination is free of shadows and reflected glare. The effect of daylight, the most desirable condition for human vision, is achieved and the disadvantages of depending upon natural light, with its constantly shifting values, are eliminated.

The even spread of artificial light across the PLEXIGLAS surfaces and the absence of visible lighting fixtures make the luminous ceilings architecturally appealing. Higher light intensity and full color values for the paintings are supplied by directional louvers and recessed spotlights.

PLEXIGLAS luminous ceilings satisfy the requirements of architects and lighting engineers for low brightness ratios, high illumination levels, excellent diffusion, and fixture-free appearance. In addition, the lightweight yet strong diffusers are removed easily and safely for cleaning and for access to the lighting source, resulting in a sustained high level of lighting performance.

If *you* have a lighting problem, investigate "daylighting" with a PLEXIGLAS luminous ceiling. We will be glad to send you technical details about the installation shown above. Write for them.

The Rohm & Haas exhibit at the Fourth International Lighting Exposition and Conference, May 6-9, Public Auditorium, Cleveland, Ohio, will be in Booth 153.

Special Galleries, Museum of Fine Arts, Boston, Massachusetts. Architects: Leland and Larsen, Boston. Illuminating engineers: Thompson Engineering Company, Boston. Photograph courtesy of General Electric Company.

CHEMICALS FOR INDUSTRY

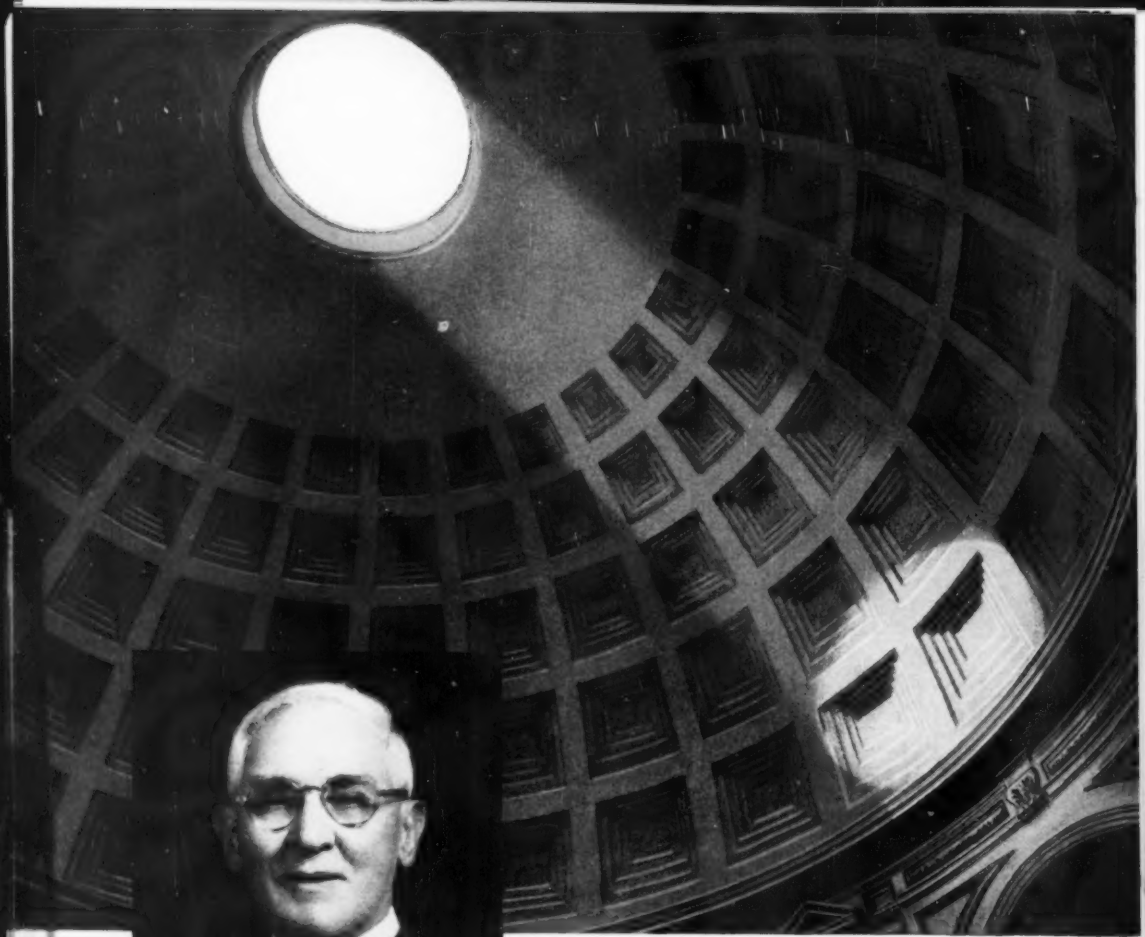
ROHM & HAAS COMPANY

WASHINGTON SQUARE, PHILADELPHIA 5, PA.

Representatives in principal foreign countries

PLEXIGLAS *is a trademark, Reg. U.S. Pat. Off. and other principal countries in the Western Hemisphere.*

Canadian Distributor: *Crystal Glass & Plastics, Ltd., 130 Queen's Quay at Jarvis Street, Toronto, Ontario, Canada.*



A man's work is his Cathedral

Edwin F. Guth, Sr., has given fifty years of his life to his work with almost religious devotion. His efforts have been rewarded.

His company, now celebrating its Golden Anniversary, is recognized as one of the leaders in the lighting industry. He has achieved fame for his contributions to the betterment of lighting. We at GUTH pause to honor this man who has shaped the past and future of our company.

Thanks, E. F. Guth, Sr. And thanks to all of you who have been so wonderful to us during this past half-century.

GUTH'S GOLDEN YEAR...

19 Guth 52

...leaders in lighting since 1902

THE EDWIN F. GUTH CO. / ST. LOUIS 3, MO.

"...his deeds have made us what we are today"

In devoting a half-century to his work, Edwin F. Guth, Sr., has built a record of accomplishments that stands as a monument to his untiring spirit:

Founded our company April 22, 1902.

Invented over 150 patented lighting devices.

Designed the world-famous BRASCOLITE.

Introduced the first "Packaged" Lighting Fixtures for distribution through wholesalers.

Designed and manufactured cast bronze lighting equipment for many state capitols and other public buildings all over the world.

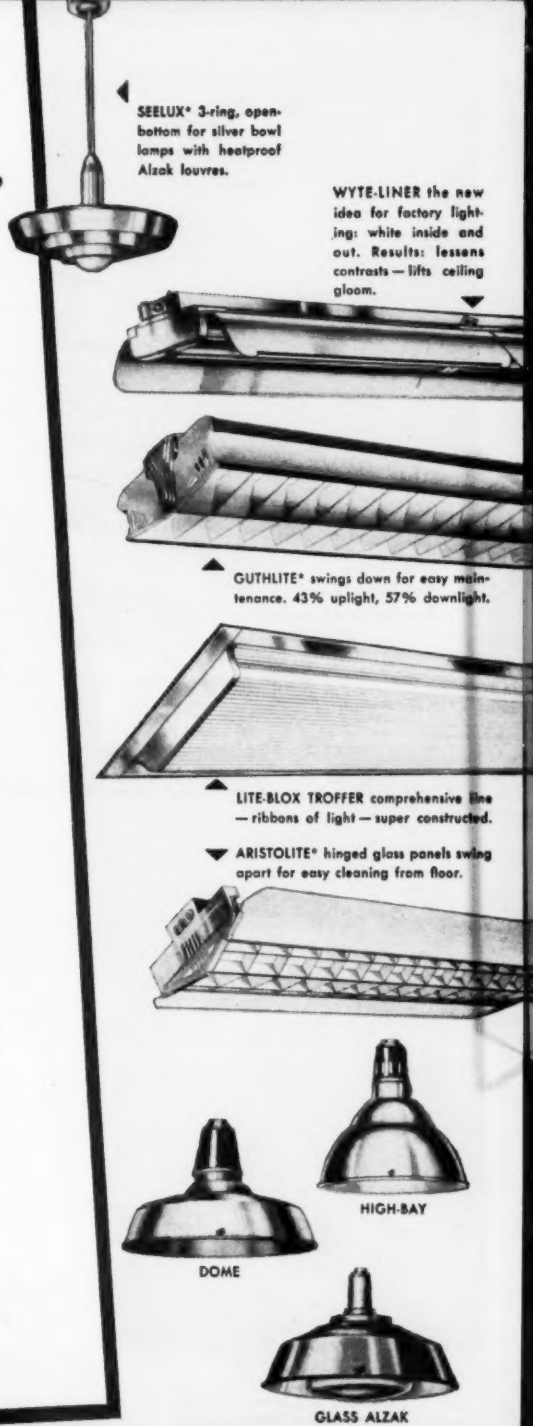
Produced the finest reflector finishes as they were developed—Alzak Aluminum, Porcelain Enamel, 300° White, and Electroplated Finishes.

Created the famous GUTHFAN—the first improved fan over a 30-year period.

Designed and manufactured lighting equipment through all stages of lighting development—Gas Fixtures, Gas Mantles, Combination Gas & Electric, Carbon, Gem, Tantalum, Tungsten, Mercury, Fluorescent, and Germicidal—from 1902 to the present.

Honored by the National Association of Manufacturers which named him, "A Modern Pioneer on the Frontier of American Industry".

THE EDWIN F. GUTH CO. / ST. LOUIS 3, MO.


SEELUX* 3-ring, open-bottom for silver bowl lamps with heatproof Alzak louvres.
WYTE-LINER the new idea for factory lighting: white inside and out. Results: lessens contrasts—lifts ceiling gloom.
GUTHLITE* swings down for easy maintenance. 43% uplight, 57% downlight.
LITE-BLOX TROFFER comprehensive line—ribbons of light—super constructed.
ARISTOLITE* hinged glass panels swing apart for easy cleaning from floor.
HIGH-BAY
DOME
GLASS ALZAK

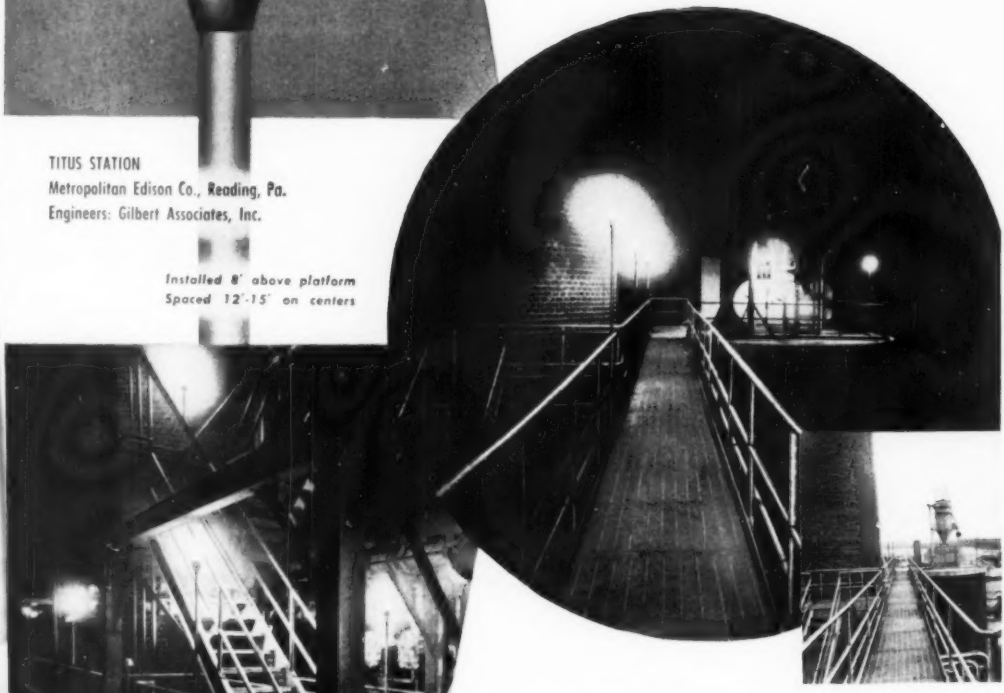
INDUSTRIAL INCANDESCENT reflectors for better light control at the working plane.

* ® and Patents Pending

Outdoor Lighting for Modern Plants featuring the HOLOPHANE A-WAY* POSTOP*

TITUS STATION
Metropolitan Edison Co., Reading, Pa.
Engineers: Gilbert Associates, Inc.

Installed 8' above platform
Spaced 12'-15' on centers



The A-WAY POSTOP serves a three-fold purpose for industrial plants: (1) Increased pedestrian and vehicular safety; (2) Protection against after-dark intruders; (3) Illumination of work locations . . . It provides rail-lighting for catwalks at outdoor boiler plants and oil refineries, also lighting for passageways, driveways and walks. Its distribution is asymmetrical, redirecting light usually wasted and adding it to required areas, with excellent uniformity. Sturdily built, totally enclosed, POSTOP is weather proof and designed for enduring, easily-maintained serviceability.

Visit BOOTH 358—4th International Lighting Exposition

• Engineering Services are rendered, and recommendations submitted, without charge, through professional advisers.

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Lighting Authorities Since 1898 • 342 MADISON AVENUE, NEW YORK 17, N.Y.
THE HOLOPHANE COMPANY, LTD., THE QUEENSWAY, TORONTO 14, ONTARIO

To get efficient fluorescent lighting ...insist on *This Shield on your ballast*

There's more to satisfactory fluorescent lighting than lamps and a reflector. There's always a ballast in the fixture . . . and the way it performs determines whether you'll get *full lamp life, rated light output* and *satisfactory performance.*

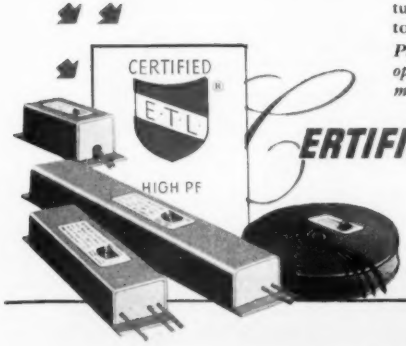
Only CERTIFIED BALLASTS carry the shield that assures best lighting. That's because CERTIFIED BALLASTS are made to precise specifications, then tested by Electrical Testing Laboratories, Inc., which certifies they conform to these high standards.

There's no excuse for inefficient, unsatisfactory fluorescent lighting when CERTIFIED BALLASTS are available.

Be sure every fixture you get has CERTIFIED BALLASTS . . . the ones with the shield.

● Complete information on the types of CERTIFIED BALLASTS available from each participating manufacturer may be obtained from Electrical Testing Laboratories, Inc., East End Ave. at 79th St., New York, N. Y.

Participation in the CERTIFIED BALLAST program is open to any manufacturer who complies with the requirements of CERTIFIED BALLAST MANUFACTURERS.

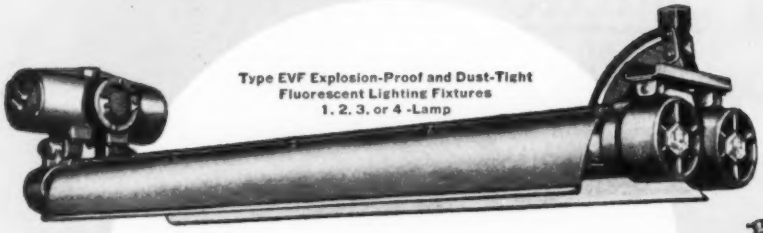


CERTIFIED BALLAST MANUFACTURERS

Makers of Certified Ballasts for Fluorescent Lighting

2116 KEITH BLDG., CLEVELAND 15, OHIO

CROUSE-HINDS High Efficiency LIGHTING EQUIPMENT . . .



Type EVF Explosion-Proof and Dust-Tight Fluorescent Lighting Fixtures
1, 2, 3, or 4 -Lamp

EV Series Explosion-Proof and Raintight Lighting Fixtures

. . . for Hazardous Locations

Crouse-Hinds explosion-proof lighting fixtures exceed the requirements for service in highly explosive atmospheres. They are designed to operate at a temperature below the ignition temperature of the gas-air or vapor-air mixture. They are so strong that they will resist internal explosions without damage and so tight that they will prevent the escape of flames or burning gases which might ignite the surrounding atmosphere.

Crouse-Hinds dust-tight lighting fixtures assure safety in locations that are hazardous because of the presence of combustible dust.

DL Series Dust-Tight and Raintight Lighting Fixtures

Type MDB-14 Floodlight

. . . for Wet and Corrosive Locations

Crouse-Hinds vaportight lighting fixtures are ideal for use in boiler rooms, powerhouses, shower rooms, tunnels, loading docks, building entrances, and all indoor and outdoor locations where exposed to moisture and rain, non-explosive vapors and gases, or non-combustible dusts.

Hundreds of industrial lighting fixtures are listed in Crouse-Hinds Condulet Catalog.

V Series Vaportight and Raintight Lighting Fixtures

Type ADE-14 Heavy Duty Floodlight

. . . for Protection

Sabotage thrives in darkness. The most reliable and cheapest form of protection against night prowlers is LIGHT! Crouse-Hinds floodlights project powerful beams of light that bathe all approaches to your property with glaring radiance, killing darkness and shadows and compelling everyone to be more visible at night than in broad daylight.

The protective power of light should be used in all important municipal and industrial locations. The floodlighting of industrial plants serves a double purpose. It helps to boost production in addition to the security it provides.

Send for your copy of Bulletin 2565, "LIGHT! Protect Your Property."

Type DCX Searchlight

A Nationwide Distribution Through Electrical Wholesalers

Crouse-Hinds Exhibit will be in Booths 365-366

CONDULETS • TRAFFIC SIGNALS • AIRPORT LIGHTING • FLOODLIGHTS

CROUSE-HINDS *offers all 3 types*

of high intensity airport runway lights

The Crouse-Hinds Company offers all three types of high intensity fixtures to meet the three CAA Specifications (L-818, L-819 and L-820). All three fixtures (types HRC, HRL and HSL) are approved by CAA.

Type HRC utilizes a double prismatic lens system on a cast aluminum base, with a 500-watt, 115-volt lamp mounted on a movable socket. The main beams may be "toed in" or "toed out" by remote control from the tower to provide the best setting for particular visibility conditions. The candlepower is the highest of the three types. In bad weather the pilot sees more lights and sees them sooner with this system.

Type HRL is constructed with an optical prismatic Pyrex globe mounted on a 3-piece cast aluminum fixture assembly. Each fixture uses a 200-watt lamp and is provided with a series-to-series insulating transformer installed underground in the base housing.

This system has the lowest installation cost. Its use is often justified for non-instrument runways, as well as instrument runways.

Type HSL has a cast aluminum housing with two 95-watt sealed beam high intensity lamps inside and a 30-watt medium intensity light on top. Three insulating transformers are installed underground in the base. Each of the three lamps may be switched separately from the tower.

This system is economical to operate, since only 95 watts is used for the high intensity beam, and a 30-watt light is used in good weather. This fixture provides a main beam in only one direction, without the background haze resulting from the "back beam". After relamping, the sealed beam optical system is back to 100% initial efficiency.

All three fixtures provide the basic high intensity candlepower required and the three types have many construction features in common such as: cast aluminum housing, Pyrex glassware, disconnecting cable connector, same breakable coupling and standard steel base with base plate. All three units provide the necessary top light and side light needed for planes not on the approach path and all use a 5-stage brightness control.

Write for Bulletin 358-F. It contains detailed features and an impartial comparison of the relative advantages of the three systems with estimated installation costs of each.

CROUSE-HINDS COMPANY
Syracuse 1, N. Y.

A Nationwide Distribution Through Electrical Wholesalers

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AIRPORT LIGHTING · FLOODLIGHTS · CONDULETS · TRAFFIC SIGNALS

Defense Production

makes more important than ever the Specification of Lighting Units that meet

RLM High Quality Standards

for Efficiency, Durability and Uniformity

Vital to defense and essential civilian production, are lighting units that *can be depended upon* to provide the right quantity and quality of light, economically, dependably and with a minimum of servicing need and maintenance cost.

Defense production demands lighting equipment with the ability to *sustain its rated light output* efficiency over hundreds of cleanings so that the proper high illumination levels may be maintained. It demands the *durability* found so essential to industrial lighting and the avoidance of production interruptions and inefficiency due to abnormal wear, distortion or breakdown. It demands fullest *protection from glare* through proper diffusion and shielding.

All of these, and many other conditions for proper lighting of defense plants can be met through the specification of RLM-Labeled Lighting Units. All units bearing the RLM Label are warranted by Electrical Testing Laboratories to conform to the minimum standards established by the RLM Standards Institute for efficiency, durability and uniform quality.

FREE RLM BOOKLETS containing complete specifications for all RLM-Certified Industrial Fluorescent and Incandescent Lighting Units and the names of all manufacturers of RLM-Labeled Units may be obtained by writing: RLM STANDARDS INSTITUTE INC., Suite 819, 326 West Madison Street, Chicago 6, Illinois.

Specification of RLM-Labeled Units Assures Conformance to ALL these Essentials of Defense Production Lighting

NAME OF MANUFACTURER
RLM
ELECTRICAL TESTING LABORATORIES, INC.

DIFFUSION WITH HIGH REFLECTION FACTOR
RLM Porcelain-Enameled Steel Reflectors must have a mean reflection factor of 82% . . . an assurance of more light for the money. Porcelain enamel reflecting surfaces *diffuse* light from the lamp and help provide proper *quality* of illumination.

TOP QUALITY PORCELAIN-ENAMELED REFLECTORS
RLM Reflectors are built of not less than .032" reflector steel covered with .025" fused on porcelain enamel that will not chip, corrode or deteriorate under industrial operating conditions.

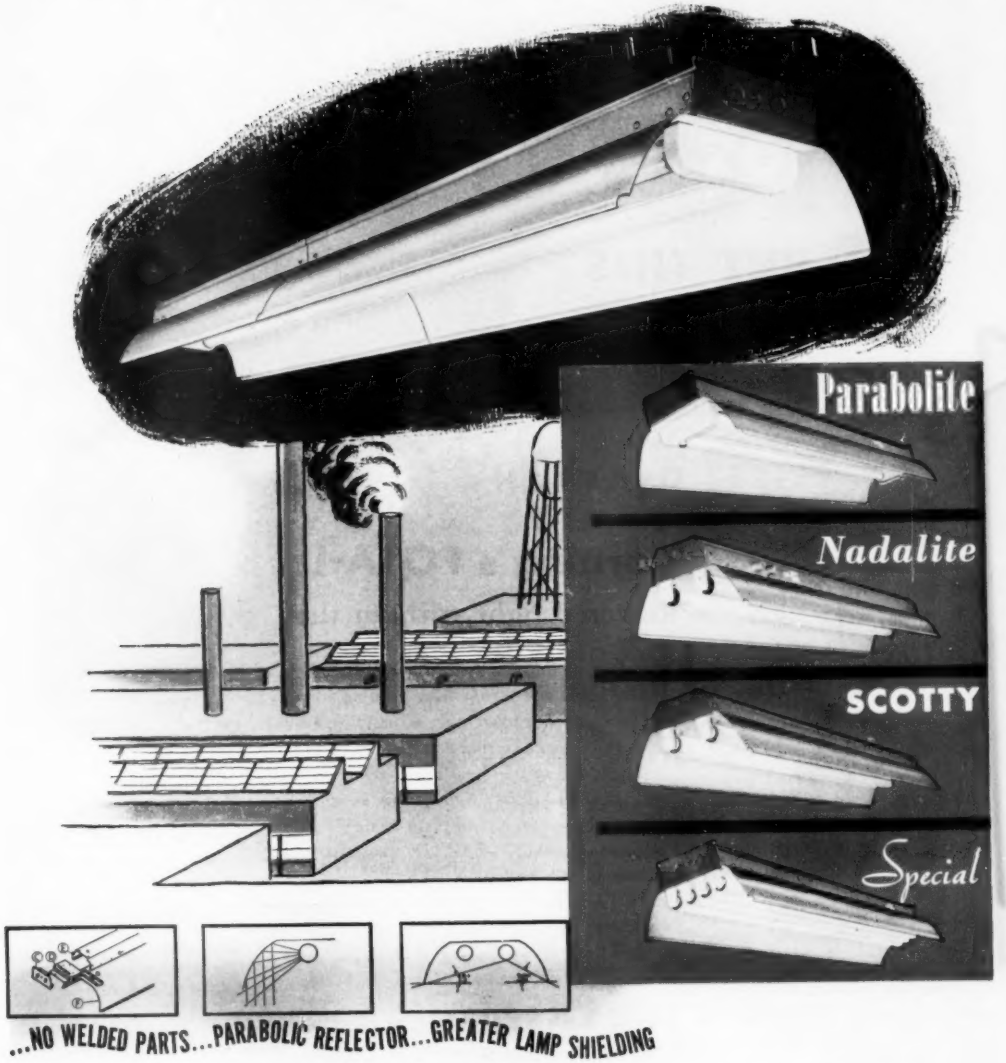
APPROVED REFLECTOR DESIGN
Reflector design of RLM Units conforms to specifications embodying approved practices of illuminating engineering.

HIGH POWER FACTOR BALLASTS
RLM Standards specify the use of certified ballasts which last longer, because they are designed to prevent excessively high temperature operation.

UNIFORM QUALITY
RLM Standards insist on the maintenance of uniform quality as to materials and construction, thus assuring the buyer of uniform lighting performance from each unit installed.

RLM STANDARDS INSTITUTE
INCORPORATED
The letters RLM stand for Reflector and Lighting Equipment Manufacturers

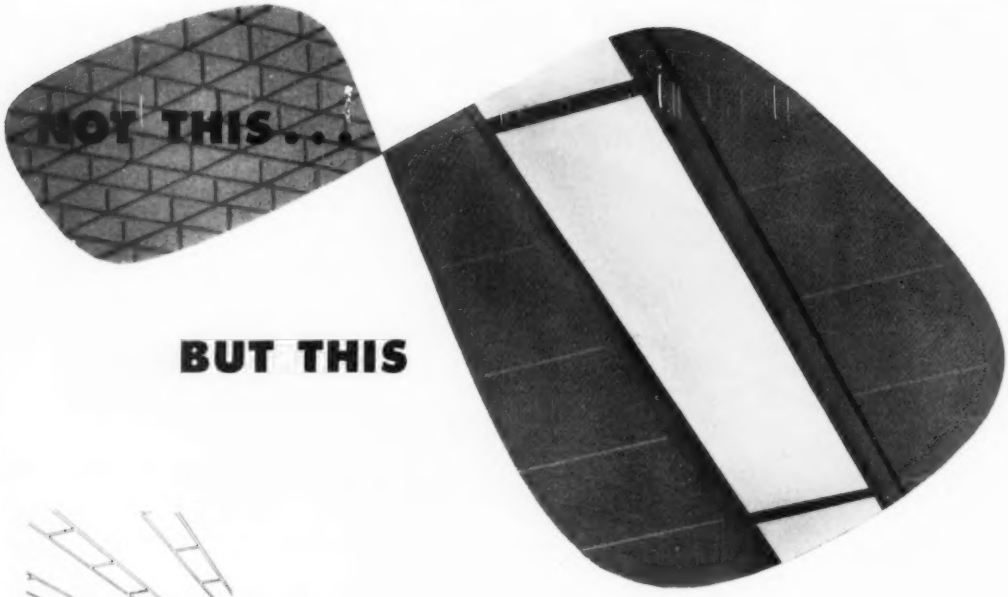
a new line of Industrial fixtures!

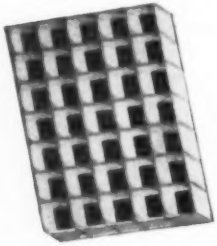


...NO WELDED PARTS...PARABOLIC REFLECTOR...GREATER LAMP SHIELDING

A complete new line of more than 150 models in three basic price ranges featuring parabolic reflector for maximum down light . . . normal lamp cut-off of 15°, which is in excess of all laboratory requirements . . . and toughest possible resistance to oxidation. There are no welded parts—sections are phosphatized and finished before being assembled with plated screws.

GIBSON Manufacturing Co. 1919 PIEDMONT CIRCLE, N. E., ATLANTA, GEORGIA





The tiny opal louvers are part of the glass itself—will not deteriorate with age or weathering—save metals—lower maintenance costs.

Corning's FOTA-LITE gives you louvered light without the "egg crate" effect

Dust-catching louvers reduce the efficiency and mar the beauty of louvered lighting installations, but with Corning's FOTA-LITE, there is no such problem. The louvers are actually part of the glass itself . . . presenting a smooth, flat surface that can be wiped clean quickly.

Thousands of tiny opal louver cells permanently embedded in its 1/8" thickness diffuse light evenly at normal viewing angles giving the glass the appearance of plain opal. Vertical light is practically unrestricted. Not color-selective, FOTA-LITE transmits the true color of the light source . . . gives unusual light quality.

FOTA-LITE is strong, light in weight, and free of warpage. It is ideal for enclosed fixtures, totally luminous ceilings . . . wherever louvered lighting *without bulk* is desired. Louvers in the standard product are accurately designed for 45° cut-off. For other applications, a wide variety of patterns can be produced in the glass.

FOTA-LITE is featured in ceiling installations and top quality luminaires by the leading manufacturers of lighting fixtures.

For complete information send for Bulletin LS-32 which describes FOTA-LITE.

CORNING GLASS WORKS

CORNING, NEW YORK

Corning means research in Glass

SEE US AT THE 4th INTERNATIONAL LIGHTING EXPOSITION, CLEVELAND

CORNING GLASS WORKS, Dept. EC-4, Corning, N. Y.

Please send ☐ Bulletin LS-32 describing FOTA-LITE.

Name_____ Title_____

Firm_____

Address_____

City_____ Zone____ State_____

"modern-lite" . . . TOMORROW'S FLUORESCENT FIXTURES . . . TODAY!

MANUFACTURED BY MODERN LIGHT & EQUIPMENT COMPANY

MODEL NO. H-24P-496-4

Harvard Series—4-lamp 96", 430 M.A. commercial Slim-Line fixture with plastic ribbed side panels; hinged louver. Available also in other sizes.

MODEL NO. H-24M-496-4

Harvard Series—4-lamp, 96", 430 M.A. commercial Slim-Line fixture with new indirect lighted metal side panels; hinged louver. Also available in other sizes.

MODEL NO. HG-448

Harvard Series—4-lamp, 48" commercial Fluorescent fixture with plastic ribbed side panels, hinged Alba-Lite ribbed glass bottom. Also available in other sizes.

HARVARD SERIES

NEW design, new beauty, new lighting efficiency . . . in a series of commercial fixtures so versatile in their functional design that they fit into any type of installation for offices, schools, stores, institutions, etc.

A Wide Range of New Commercial and Industrial Units

You'll find Modern-Lite one of the most COMPLETE lines of Fluorescent and Slim-Line Lighting fixtures ever designed and manufactured by one company; a single source for ALL of your needs. With our own steel fabricating, finishing and assembly plants we have many resources and advantages which we are happy to pass along in the form of service and price benefits to the distributors of Modern-Lite products.

See us at the Fourth International Lighting Exposition, Booths 414—415.

MODERN LIGHT & EQUIPMENT CO.

3812 S. WABASH AVE., CHICAGO 15, ILL.

MAIL COUPON for new catalog and illustrated Price Book.

Modern Light & Equipment Co.
3812 S. Wabash Ave., Chicago 15, Ill.

Gentlemen: Please send us your new Modern-Lite catalog and illustrated price book.

Firm Name_____

Address_____

City_____ Zone____ State_____

By_____
(Individual Name and Title)

NATIONAL DISTRIBUTION THROUGH LEADING ELECTRICAL WHOLESALERS

See these ABOLITE "Firsts"

AT THE 4th INTERNATIONAL LIGHTING EXPOSITION
CLEVELAND, OHIO BOOTH No. 254

JIFFYLITE . . .

ABolite introduced for industrial and commercial use the first Jiffylite . . . an all-purpose unit which fits into any standard socket and provides an abundance of light, directed where you want it . . . no fuss . . . no bother. Of course, Jiffylite has the popular "Whiter than White" lifetime porcelain enamel finish.

PROTECTO-REFLECTOR . . .

During the past several years the manufacturers of ABolite Lighting have set the pace for "firsts" in the industry. The ABolite Protecto Reflector, using the General Electric R-52 lamp, was a pioneering step forward in the protection of hot lamps against water damage and dirt fogging and constantly improving reflectivity.

FARM UTILITY OR BROODER LIGHT . . .

The design and construction of this new "ABolite First", a versatile Farm Utility and Brooder Light, was widely accepted in rural areas, where a serviceable, all-purpose farm light can serve, not only in brooding houses but many other general uses on the farm.

YARDLITE . . .

The new ABolite Yardlite, complete with reflector mounting pipe, elbow and bracket, is ideal for outdoor installations and can quickly be adapted to indoor use with a simple mounting plate. Its application for areaways, garages, attics, driveways, and many industrial or commercial uses, offers maximum utility.

LISTED UNDER RE-EXAMINATION SERVICE UL UNDERWRITERS' LABORATORIES, INC.

GENERAL . . .

ABolite manufactures a complete line of industrial, commercial, floodlighting, farm and home lighting equipment. ABolite is first with the finest in design and construction in the incandescent lighting field.

WHITER THAN WHITE

RLM STANDARD DOME

SHALLOW DOME

SYMMETRICAL ANGLE

DUO-MOVE SYSTEM

GLASS STEEL DIFFUSERS

MERCURY VAPOR UNITS

SOLD ONLY THROUGH ELECTRICAL WHOLESALERS

ABOLITE Lighting DIVISION

THE JONES METAL PRODUCTS CO., West Lafayette, O.

WHAT IS YOUR EXPERIENCE, MR. EXPERT?

many seconds

HOW ~~LONG~~ SHOULD IT TAKE TO INSTALL THE NEW *Ruby-Philite* TROFFER

make a memo of your lowest "guess-timate" now!

Take it with you to NEMA'S 4TH INTERNATIONAL LIGHTING EXPOSITION, in Cleveland, May 6th-9th. Stop at Ruby-Philite's BOOTH No. 158 and match your guess against actual, timed installations of the new Ruby-Philite troffer in a typical JM ceiling opening. But, be careful . . . keep your "guess-timate" low! You're liable to find the troffer completely installed, without the use of tools, before you can say, "That's Impossible!"

PHILITE

Ruby-Philite Corp.

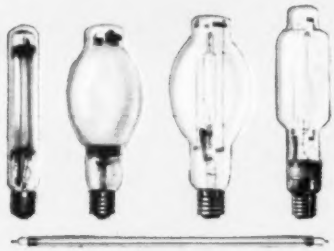
32-02 QUEENS BLVD., LONG ISLAND CITY 1, N. Y.

EMPLOYEES SAY,

1000-watt mercury high-bay luminaire 25 ft. and over

400-watt millite luminaire
16 ft. and over

400-watt mercury luminaire
16 ft. and over



Complete range of lamps, including the new color-corrected J-H1 400-watt lamp.

3000-watt mercury luminaire
40 ft. and over

Complete range of ballasts for high or low-voltage distribution systems.

"Better than daylight"

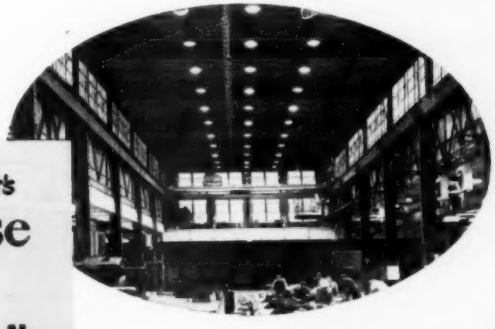
with Westinghouse MERCURY lighting

"We get over 50 footcandles evenly distributed in this work area—and have completely eliminated the need for auxiliary lighting," says Chief Electrician of an Ohio plant about their new main high-bay-assembly area.

What's more, he further states that the employees report, "It's even better than working in daylight . . . there are no shadows or glare." A Westinghouse combination mercury-incandescent system takes credit for these results.

He concluded, "We have always believed that high-quality illumination pays for itself in more and better work, fewer errors . . . and this installation, made according to a plan, proves that it does just that." Only Westinghouse can offer you the complete mercury system—luminaires, lamps, and ballasts.

It will be well *worth your while* to investigate Westinghouse, where you can review all sources and all types before selecting one system. Get B-4727, "Lighting at Work" in every industrial area. Call your nearest Westinghouse Office or write: Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-04298



YOU CAN BE SURE...IF IT'S
Westinghouse

LIGHTING DIVISION
Edgewater Park, Cleveland

. . . so more and more people are using

Certified Starters

CERTIFIED STARTERS are made to precise specifications that assure positive, quick starting and a life of at least 36,000 operations!

CERTIFIED STARTERS thus reduce fluorescent lighting maintenance costs as well as assure full lamp life and overall lighting satisfaction.

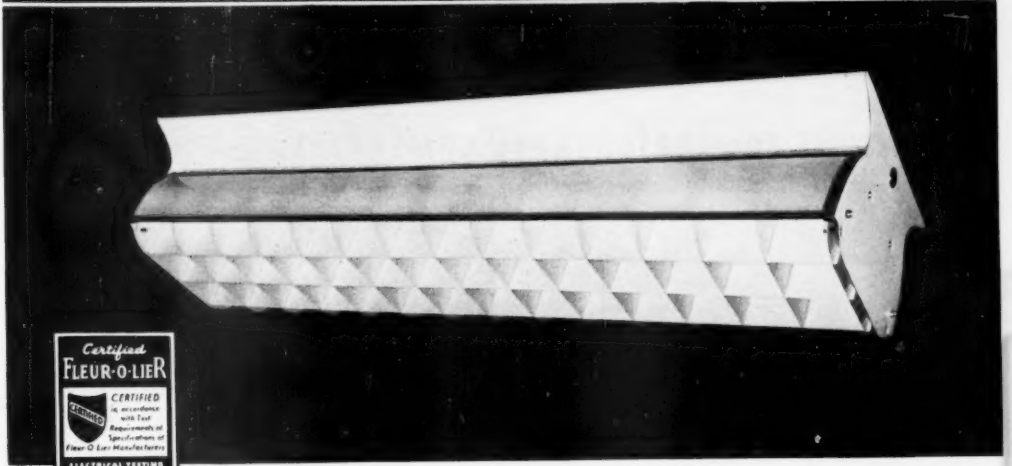
CERTIFIED STARTERS are better because they are made better and Electrical Testing Laboratories, Inc., checks them to certify they meet the manufacturing specifications.

Reduce your fluorescent lighting costs and improve lighting performance by insisting on CERTIFIED STARTERS!

Certified Fluorescent Starter Manufacturers

2116 KEITH BUILDING • CLEVELAND 15, OHIO

Announcing the 900 *Line*



Certified FLEUR-O-LIER
CERTIFIED in accordance with Test Requirements of Specifications of Fleur-O-Lier Manufacturers
ELECTRICAL TESTING LABORATORIES, INC. NEW YORK N. Y.

GILL'S new, semi-direct lighting Luminaires

Featuring Low, Uniform Brightness!

Here it is! The new 900 Line . . . softly luminous, semi-direct lighting Luminaire by GILL . . . importantly featuring *low brightness*. Its many features make it the perfect luminaire for office—stores—schools.

The 900 Line has curved glass side reflectors for unexcelled, uniform brightness, and may be installed directly on the ceiling in individual or continuous row arrangements. If specified, plastic or metal side reflectors can be supplied.

These luminaires provide 45° shielding in both directions, and, even with the extra large louvres for easy cleaning, low brightness is still maintained.

The Gill 900 Line carries the certification of Underwriters laboratories, Fleur-o-lier, ETL.

Sizes: 2, 3, and 4 lamp, bi-pin fluorescent lamps and/or single pin SLIMLINE lamps in 48" or 96" sizes (lengths).

For full information, fill in coupon and mail us today. A prompt answer is assured.

Visit
BOOTH #165
at the
CLEVELAND
LIGHTING EXPOSITION

See
GILL'S
NEW 900 LINE

Gill Glass and Fixture Company
Amber & Tioga Sts., Philadelphia 3, Pa.
Please send information on Gill's new 900 line
Name .....
Firm .....
Address ..... Zone ..... State .....
City .....

GILL

GILL

GLASS and FIXTURE COMPANY • Amber & Tioga Sts., Phila. 34, Pa.

glare-free fluorescent . . . nearest to daylight!

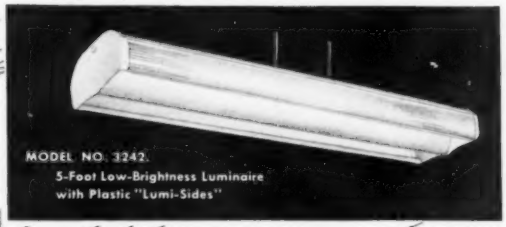
Perfected

Best for Schools

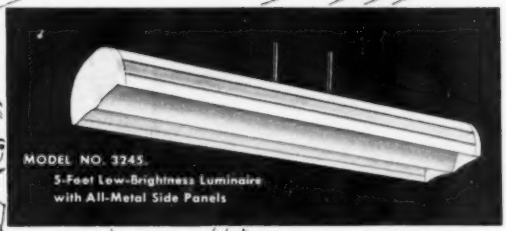
IN MITCHELL LOW-BRIGHTNESS LUMINAIRES

MITCHELL engineering develops the maximum advantages of the new low-brightness T-17 lamps in two superior Luminaires . . . at the lowest owning and operating cost per footcandle delivered.* Here is light distribution with absence of glare comparable to daylight conditions. No cross-louvering is required (lowers initial and maintenance costs); provides desirable 40° crosswise cutoff. High light output with low lamp brightness provides ideal illumination for schools, libraries, public buildings and institutions. Modern, functional design is largely self-cleaning. Exclusive MITCHELL mounting features simplify installation. For the best buy in low-brightness lighting, it's wise to specify MITCHELL.

**Ask for revealing Cost Comparison Chart*



MODEL NO. 3242.
5-Foot Low-Brightness Luminaire
with Plastic "Lumi-Sides"



MODEL NO. 3245.
5-Foot Low-Brightness Luminaire
with All-Metal Side Panels

CHECK THESE MITCHELL LOW-BRIGHTNESS ADVANTAGES:

Highest Footcandle Output	✓
Glare-free Illumination (surface brightness less than 2 cp/sq. in.)	✓
Lowest Fixture Cost (fewer units, no louvers required)	✓
Lowest Installation Cost	✓
Lowest Maintenance Cost (largely self-cleaning)	✓
Lowest Owning and Operating Cost per Footcandle Delivered	✓
Attractive Functional Design	✓

Write for the complete MITCHELL Commercial Fluorescent Lighting Catalog. Have the full details on MITCHELL Low-Brightness Luminaires, for quick, easy specification.

Mitchell Manufacturing Company, Dept. 2D
2525 N. Clybourn Ave., Chicago 14, Ill.

☐ Please send complete Commercial Lighting Catalog
☐ Please send Cost Comparison Chart

Name_____

Firm_____

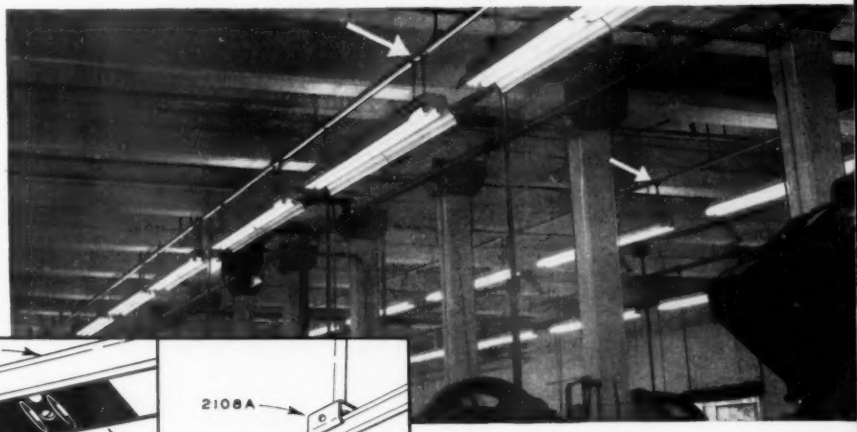
City_____ Zone____ State_____

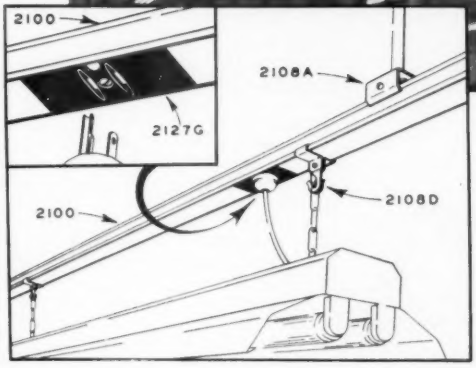
MITCHELL

MITCHELL MANUFACTURING COMPANY
2525 N. Clybourn Avenue, Chicago 14, Illinois
In Canada: Mitchell Mfg. Co., Ltd., 19 Waterman Avenue, Toronto

FACTORY LIGHTING MODERNIZATION WITH 2100 PLUGMOLD

WIREMOLD ENGINEERING DATA ★





Here is a simple, practical plan for lighting modernization adaptable to a wide range of industrial areas. Use of the No. 2100 Plugmold System for both wiring and support of the lighting fixtures has many advantages. Rewiring accomplished economically and with minimum disturbance in the working areas. The plug-in feature with No. 2127G grounded receptacles permits easy removal of fluorescent units for cleaning and maintenance. Plugmold No. 2101A rigid couplings between sections and the use of No. 2108A hanger clamps result in ample rigidity to span beams. No. 2108D fixture hooks permit supporting fluorescent units from the channel.

This is, of course, just one of a great many ways in which Wiremold Surface Metal Raceways and industrial Plug-in-Anywhere Wiring Systems can be used to rewire for lighting modernization as well as for more convenient power services.

Write for a copy of Engineering Data Sheet No. D-4 detailing this particular installation . . . or outline your own rewiring problem for our Engineering Department's recommendations.

THE WIREMOLD COMPANY
HARTFORD 10, CONN.

THE WIREMOLD COMPANY
Dept. A, Hartford 10, Conn.

Please send me a copy of WIREMOLD Data Sheet D-4.

*Name*_____

*Company*_____

*St. & No.*_____

*City*_____ *State*_____

18WM52

Is this a BARGAIN?

Whether he's shopping for television receivers or industrial lighting fixtures, the customer will be wise to look *behind* the price tag. The lower initial cost of "cheaper" lighting fixtures is frequently more than offset by hidden *plus* costs which come to light only after the fixture is installed—the *plus* costs of extra maintenance, wasted current, poor light, and earlier replacement. You cut these *plus* costs out of lighting budgets when you sell, install or specify METALCRAFT fixtures!

SAMSON

METALCRAFT'S New Industrial Unit

Ruggedly built of heavy gauge steel, die-formed for uniform construction. Quarter-turn "Shakeproof" wing nuts for easy installation and removal of reflector. Fluorescent or slimline. 2-or-3-Lamp conventional or turret sockets. Porcelain enamel or baked enamel finish. Shielding assembly optional.

WRITE FOR NEW BULLETIN No. SN-1051

the Metal-craft line

METALCRAFT PRODUCTS CO., INC. • Manufacturers of Fluorescent and Slimline Luminaires • **Mascher & Lippincott Sts., Phila. 33, Pa.**

1952 IES Regional Conferences

The Illuminating Engineering Society is this year holding eight Regional Conferences in the various IES regional areas of the United States and Canada. These meetings began March 13, and will end June 20. They will be followed by the annual National Technical Conference of the Society which will be held September 8-13, 1952 at the Edgewater Beach Hotel in Chicago.

Three Regional Conferences have already been held: South Pacific Coast in San Francisco, March 13-14; Pacific Northwest in Victoria, B. C., Canada, March 20-21; and Southwestern in Tulsa, Oklahoma, April 6-8th.

Illuminating Engineers and others will find much of interest in the five IES Regional Conferences still to be held. Programs include a host of subjects ranging from street lighting, industrial and commercial lighting, home lighting and color lighting, to talks on light sources, lighting design, comfort rating systems, lighting quality, modular systems, and many other similar subjects. Conferences still to be held with pertinent information follows:

The Southern Regional Conference will be held at the Hermitage Hotel, Nashville, Tenn. on April 20–22nd. Some of the subjects to be discussed include: lighting a city's streets to IES standards; artificial lighting for cotton grading; ceiling grid systems; studies in utilizing and controlling daylight in classrooms; mercury and fluorescent light sources; Tennessee

G. K. HARDACRE, president, Chicago Lighting Institute, reviews success of Institute educational program at annual meeting of sponsoring companies. Mr. Hardacre is manager of commercial sales, Public Service Company of Northern Illinois and past president of the Illuminating Engineering Society.

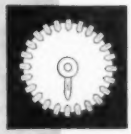
FEATURES YOU'LL LIKE

IN THE NEW

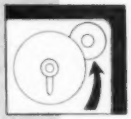
INTER-MATIC TIME SWITCH

Easy TO REMOVE MECHANISM — just press spring.

Easy TO SET TIME— just pull dial forward — turn in either direction.



Easy TO ADD EXTRA TRIPPERS without removing the dial.



Easy TO CHECK operation of the motor.

WRITE TODAY for complete information. Ask for Catalog Number **428.**

INTERNATIONAL REGISTER CO.
2624 W. Washington Bl.
Chicago, Ill.

only **$10.95** and up LIST f.o.b. factory Chicago

INTER-MATIC TIME SWITCH

AUSTIN *Top Quality, Low Cost, Easily Installed,* PORTABLE LIGHTING UNITS

Meets the demand for more adequate light. For all outdoor spot and floodlighting jobs — quickly, easily and economically installed. Completely packaged for your convenience.

LS-5
150 watt lampholder mounted on sturdy metal spike for nailing to side of building, post or tree, or inserting in ground. Complete with 5' cord and plug.

LS-10
Same as above, with 10' cord and plug.

LC-2
150 watt bracket type lampholder complete with combination cover for mounting on 3¼" or 4" octagon box, post or wall. Includes 20" of portable cord with stripped and tinned leads. Cover has knockouts to fit box ear centers and to allow cord to enter box.

LC-5
Same as above, with 5' cord and plug.

CLD-150 LAMPHOLDER

150 watt lampholder with "floating socket" which moves forward or side to side in an eccentric plane to compensate for variations in size and shape of lamps, sockets or castings. Insures tight seal and positive electrical contact. Completely wired. Patent applied for.

CLD-35
Same as above for 300 and 500 watt mogul base lamps.

CPB-150
CLD-150 "floating socket" lampholder mounted on PB-½ wall or pole bracket having 2 porcelain insulating tubes to protect leads.

COMBINATION UNIT
CLD-150 "floating socket" lampholder mounted on a CO-1 cover with ½" threaded hub in center. Cover fits 3¼" round ceiling pans, 3¼" and 4" octagon boxes and concrete boxes. Provided with knockouts to fit box ear centers and to allow cord to enter box.

CLD-sp-150
CLD-150 "floating socket" lampholder mounted on sturdy metal spike, with 10' cord and plug.

CLD-sp-35
Same as above, with CLD-35 "floating socket" lampholder for 300 and 500 watt mogul base lamps.

The M. E. Austin Company
NORTHBROOK, ILLINOIS

Write for Information and Prices

QUALITY

YEAR AFTER YEAR AFTER YEAR AFTER YEAR AFTER YEAR AFTER YEAR AFTER YEAR

WITH

MULTI

YOU CAN BE SURE OF QUALITY

PLENTY OF QUALITY IN THIS FIXTURE

GIVES PLENTY OF LIGHT HERE AS YOU CAN SEE

AND PLENTY OF LIGHT HERE AS YOU CAN SEE

With This RLM Standard Dome Porcelain Enameled Reflector For General Overall Lighting.

Photographs from The New Modern Plant of the American Cyanamid Co. Chicago

MULTI ELECTRIC MFG. INC.

4223 W. LAKE ST. CHICAGO 24

NEW PORTABLE LAMP and appliance outlet device is demonstrated at St. Paul electrical trade show by D. W. Rice, National Electrical Products Co. (left) while contractor A. J. Buge, Milwaukee, Wis.; Al Kopald, NEPCO, Chicago; and F. S. Clayton, Federal Electric Products Co., Milwaukee, watch attentively.

home in a new light; and rural applications of lighting and infrared lamps.

The Canadian Regional Conference will be held in Niagara Falls, Ont., Canada, at the Hotel General Brock April 30-May 2nd. (Details of the program for this conference were not available at the time this summary was prepared).

The Great Lakes Regional Conference will be held May 5–6 in the Hotel Statler, Cleveland. Some of the lighting topics to be discussed are: what goes into good (lighting) design; new lamps, new lamp data; more and better ballasts; are comfort rating systems ready; why color and which one where; louverall and the occupancy module at Detroit Edison; prospects of light, air and sound conditioning with luminous ceilings; and improving the quality of industrial lighting.

The East Central Regional Conference will be held in Pittsburgh, Pa. May 22–23rd at the Webster Hall Hotel. Theme for this conference is "Illumination—A Dynamic Force in Pittsburgh's Redevelopment", a tie-in with the famous reconstruction program of Pittsburgh and its environs.

Highlights of the conference sessions include: light and vision in the school and home; progress in office lighting; and progress in store lighting. Panel discussions will follow each talk.

Two inspection trips will feature this conference program. Delegates will visit schools, commercial establishments, industrial plants, institutions, a new Field House, a number of new public buildings, and one of the largest airports in the world. They will see at first hand Pittsburgh's renaissance, and the part illumination

SPERO MEANS

6 LINES *of Electrical products from* **1** *dependable* **SOURCE**

- **FLUORESCENT**
- **REFLECTORS**
- **RECESSED INCANDESCENT BOXES**
- **VAPOR PROOF UNITS**
- **FLOODLIGHTS**
- **MATERIALS FOR ELECTRICAL CONSTRUCTION**

14 INDUSTRIAL TYPES

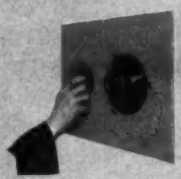
35 COMMERCIAL TYPES

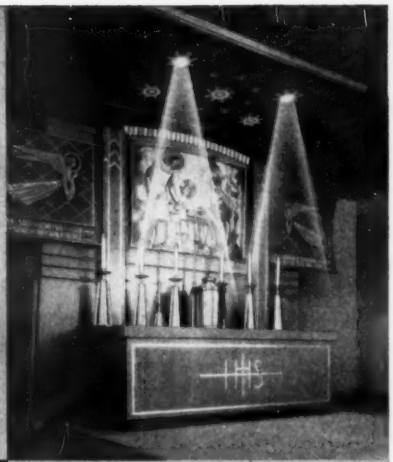
10 RECESSED TROFFER TYPES

SLIMLINE TOO... OF COURSE!!

The Spero Electric CORPORATION
18222 LANKEN AVENUE
CLEVELAND 10, OHIO

To help create an atmosphere of dignity and reverence . . .





the HOLY FAMILY MONASTERY at Farmington, Connecticut chose

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Chester Wright
Boston, Mass.

BUILDER
The Gilbane Const. Co.
Providence, R. I.

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Light Dimming Equipment

Properly controlled, light is an effective means of creating any desired atmosphere, and nowhere is this more important than in places of worship. In planning and building the Holy Family Monastery, no effort was spared to provide a physical plant ideally suited to help accomplish the purposes of this religious institution.

POWERSTAT Light Dimming Equipment was the logical choice to control both the general illumination and the downlights over the altars in the public and private chapels. The compact POWERSTAT dimmers are installed in convenient locations for dimming, brightening and blending the lighting intensity to concur with the progress of the religious service. Controlled light can be used to advantage in every school, church, theatre, restaurant, social organization or anywhere people gather together. There is a POWERSTAT Dimmer just right for each application and budget. Manually-operated and remotely controlled motor-driven assemblies are available. Any model can be readily installed in new or existing circuits. Learn more about the advantage offered by POWERSTAT Light Dimming Equipment. Send today for fully illustrated literature.

THE SUPERIOR ELECTRIC CO.
BRISTOL, CONNECTICUT

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Please send information on POWERSTAT Dimmers.

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Lower your lights for lower maintenance costs

Using two men and a crane to maintenance overhead lights is like sending *two men and a tractor to carry a wrench.* For efficient servicing of high-bay lights, **there is no faster, safer means than THOMPSON disconnecting and lowering hangers!**

Lighting maintenance costs come down with the lights, and new safety records are set by service crews when **THOMPSON** hangers are installed. Simple manual control is exercised from floor level.

Don't service your overhead lights by costly or hazardous means . . . **install THOMPSON hangers and save money!**

Write today for CATALOG No. 50 for complete details.

THE THOMPSON ELECTRIC CO.

1157 Power Avenue • Cleveland 14, Ohio

is playing in this important phase of Pittsburgh's history-in-the-making.

The Northeastern Regional Conference will be held at Hotel Preston, Swampscott, Mass., June 19–20, ending the 1952 program of Regional Conferences. (Details of the program for this conference were not available when this summary was prepared.

Guest speaker at each conference will be Samuel G. Hibben, National President of the Illuminating Engineering Society.

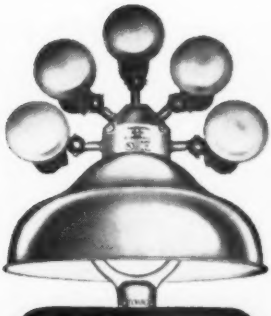
An important feature of each Regional Conference program will be the presentation of "My Most Interesting Lighting Job" by a winning representative from each Regional Section and Chapter, determined through preliminary competitions at the local level. Winners at Regional meetings will in turn compete at the National Technical Conference in Chicago at the Lighting Service Forum on September 10, 1952.

State of the Nation's Lighting

Over 20% of the best young manhood of this nation cannot see well enough to be qualified for full military service, according to Samuel G. Hibben, President of the Illuminating Engineering Society. Mr. Hibben made this observation recently when he reviewed the State of the Nation's lighting before approximately 200 members and guests attending the two-day technical sessions of the Society's South Pacific Coast Regional Conference held in San Francisco, Cal.

The Illuminating Engineering Society, Mr. Hibben continued, recognizes

OUT IN FORCE at St. Paul electrical trade show are members of Dushek Electric, Owatonna, Minn.: (L to R) David White, Emery Soweija, Joseph Dushek and Frank Fuller; to watch Frank W. Haselton, and Harry Stein of Federal Electric Products Co., demonstrate the new Stab-lok circuit breaker panel.



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STONCO ISLAND-AREA LIGHT

Use with or without cluster lights —add lights at any time. No splice box or other accessories needed. Cluster lights screw into pre-tapped, built-in cast aluminum bonnet.

You save at least an hour's wiring time when you install or add cluster lights. Removable front cover makes wiring and splicing easier and speeds up entire job. All wiring fully enclosed.

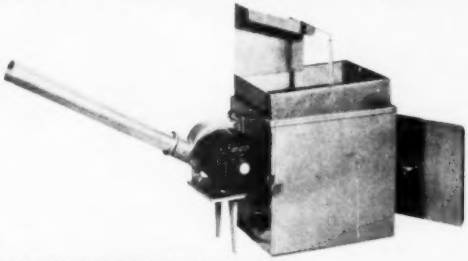
20" heavy gauge steel reflector finished in vitreous porcelain enamel inside and out—available in red, white, blue, cream, light green and dark green.

STOP EARLY BURNOUTS!

Cooler lamps have longer life. Stonco "Cushion-Seal" lamp holder assures maximum lamp cooling by *completely* exposing the hot-spot filament area to open air circulation. Makes a perfect weather-tight seal on all lamps—long or short—PAR-38 or R-40, medium or mogul. Write Stonco Electric Products Co., 485 Henry St., Elizabeth, N. J.

STONCO

FOR SAFETY'S SAKE LADUBY FLUR-O-LAMP DISPOSAL



BURNED-OUT FLUORESCENT LAMPS PRESENT A HAZARDOUS NUISANCE—

LADUBY FLUR-O-LAMP DISPOSAL

- Grinds lamps to tiny pieces under water safely, quickly and economically.
- Disposes of 100 lamps in less than 20 minutes.
- Perforated basket collects refuse. Can be dumped into any waste can.
- Operates on about 7½ gallons of water and 110 volts.
- Takes up little floor space.
- Portable, can be mounted on small hand truck.
- Standard unit equipped with 115V, 60 cycle ¼ h.p. motor.
- Shipping weight 85 lbs.

Write today for detailed information.

LADUBY (FLUR-O-LOCK) CO., INC.
P. O. BOX 88 BRANFORD, CONN.

FOR COMPLETELY RELIABLE TIME SWITCHES Be Sure You Specify PARAGON!

On any application . . . controlling yard or remote building lights . . . operating motors, stokers, burners or other industrial equipment . . . the time switches you use *must* be reliable. That's why it's smart to use Paragon's *built-in* accuracy and reliability.

Available in a wide variety of types and models for all "ON and OFF" timed-switching operations — indoor or outdoor. Time switches . . . interval timers . . . 7-day program controls . . . cycle repeaters . . . time-delay relays and reset timers . . . there's a dependable Paragon Time Control to fit your needs. 300 Series from $10.50 list.

Illustration shows Model 301 straight "ON and OFF" Time Switch for use where two or four operations per day are required. Self-starting, heavy-duty motor, available in 115 or 230 volt, SPST, SPDT and DPST models.

SEE YOUR JOBBER OR WRITE FOR INFORMATION AND CATALOG

Paragon ELECTRIC COMPANY 1614 TWELFTH STREET TWO RIVERS, WISCONSIN

WORLD'S LARGEST EXCLUSIVE MANUFACTURER OF TIME CONTROLS FOR ALL USES

Now Available

200 to 1,000 Watt

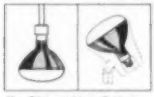
RADIANT HI-FLOOD

Reflector Weatherproof

FLOODLAMPS

NICKEL PLATED BASE
SILVER REFLECTOR INSIDE STAYS BRIGHT ALWAYS
WEATHERPROOF HARD GLASS
MAXIMUM LIGHT OUTPUT · WIDE BEAM

INDOOR OUTDOOR
High or Low Bay Installation



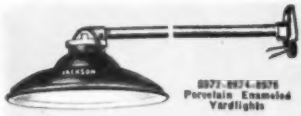
No Dirt-catching Reflectors

R-type Radiant Hi-Floods are now available in sizes from 200 to 1,000 watts for standard or high voltages to meet most industrial lighting requirements, outdoors or indoors. Hi-Floods eliminate expensive fixtures, they cost less to install. Silver reflector inside lamp requires no maintenance.

Write for Technical Bulletin 80 for full details of these rugged, economical industrial lamps.

RADIANT LAMP CORPORATION, 300 Jelliff Avenue, Newark 8, N. J.

Manufacturers of Lamps for PROJECTION ● FLOODLIGHT ● SPOTLIGHT ● MOTION PICTURE PRODUCTION SOUND REPRODUCTION ● AERONAUTICAL ● SPORTS LIGHTING AND GENERAL SERVICE ● RECTIFIER BULBS



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Porcelain Enameled Yardlights

JACKSON

Porcelain Enameled

YARDLIGHTS

"Won't Blow Down" with JACKSON you install a "life-time" Yardlight. Modern design, one piece heavy gauge steel finished with three coats of Vitreous Porcelain Enamel completely wired and assembled. Withstands wind and weather. Listed by U. L., approved for R. E. A. installations. Send for catalog.

JACKSON Quality Products

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- Sold only thru Distributors

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Small Adjustable

FLOODLIGHT

Residential—Commercial—Industrial for permanent or temporary installations. Heavy gauge steel construction, baked enamel finish. 75w and 150w. No. of durable, tough, weatherproof. Universal adjustment—install on any flat surface or attach directly to 3½" or 4" outlet box. Approved 6' cord and plug.

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Look for the Yellow Core

or rubber tapes-

OKONITE

makes *Better Tapes*

ask for them by name

SOLD ONLY THROUGH RECOGNIZED WHOLESALERS

CLEVIS-TYPE HANGER for fluorescent fixtures catches eye of contractor I. A. Baland (left), Menomonie, Wis., at St. Paul electrical convention trade show. Marv Walker (center), Pittsburgh Reflector Co.; and Bob Little, Balch-Little Co., Minneapolis, explain its advantages.

its responsibility in the preservation of human vision working towards the prevention of eyestrain rather than being primarily concerned with its cure. The IES has provided during this half century of rapid transition in the generation of light the required forthright education, standardization and exchange of lighting knowledge, he said.

Charting the growth in the lighting industry during the past half century, Mr. Hibben recalled that since the Society's founding in 1906 when gas lighting prevailed, there has been continuous progress, from the first dim 16 and 32 candlepower carbon filament incandescent lamps—relatively bulky, fragile, costly, short lived, and emitting for the same power consumption less than 10% of the light obtainable from today's highly efficient light sources.

French IES Holds Annual Convention

Members of the U. S. lighting industry will attend the annual convention of L'Association Francaise des Eclairagistes at Toulouse, France on April 30-May 4, 1952. As official IES representative, A. Homer Manwaring, Vice-President of the Illuminating Engineering Society (U. S.) will present a paper on lighting application. Others who will attend are: M. N. Waterman, Westinghouse Lamp Division, Bloomfield, N. J; Carl A. Atherton, Westinghouse Electric International Co., New York; and Eugene W. Commery, Head Residential Lighting, Lamp Division, General Electric Co., Cleveland, Ohio.

General

MEETS THE TEST!

A GENERAL PULLOUT WAS HAND-OPERATED
10,000 TIMES
WITHOUT A BREAKDOWN!

An independent, impartial laboratory subjected a General pullout to this strenuous test. It passed, surpassed itself.

10,000 COMPLETE CYCLES IS A LOT OF EFFICIENCY!

Every General product is designed to meet these difficult performance requirements. It is one of the many important reasons why you can fully rely on General — for years of maintenance-free usage . . . for unquestionable quality . . . tough construction that can withstand *any* test.

Next time, make sure it's a General — it's been tried and proved *before* you use it!

LOOK FOR THESE FEATURES!

• Trims quickly removed with new single screw assembly • More spacious wiring area • Varied and plentiful knockouts • Extra solderless connectors on bus assembly for "tap-off" • Ample contact area carries rated load without undue voltage drop • Electrolitically pure copper contacts • Improved heat dissipation keeps mechanism cooler • Large pullout handle any housewife can operate • All pullouts have flush mounting ears.

General Switch Corp.
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"the switch is to General"

General's complete line of Single — Double — Triple and Quadruple pullouts are manufactured in all popular combinations.

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ENCLOSED SAFETY SWITCHES • SERVICE ENTRANCE-EQUIPMENT • BRANCH CIRCUIT PANELS

"SKI-FLYING" FURTHER

THAN ANYONE BEFORE TAUNO LUIRO, A FINN, SET A NEW WORLD'S RECORD IN MARCH, 1951, AT OBERSTDORF, GERMANY, WITH A BREATHTAKING JUMP OF 456 FEET.

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GUARANTEED FOOTAGE
You get full measure with every roll. Tapes up tight and snug to the last inch.

NO WASTE
All Gold Seal Friction Tape tears evenly, does not ravel, molds to uneven surfaces.

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Less Gold Seal Tape needed per job. No pinholes; one tape thickness insulates.

LASTING "TACK"
Gold Seal sticks to the job under toughest conditions of cold and moisture.

EASY HANDLING
Gold Seal does not peel, dry out or smear the hands in hottest weather.

SPEEDS THE JOB
Linemen and electricians prefer Gold Seal Tape. It saves time and trouble.

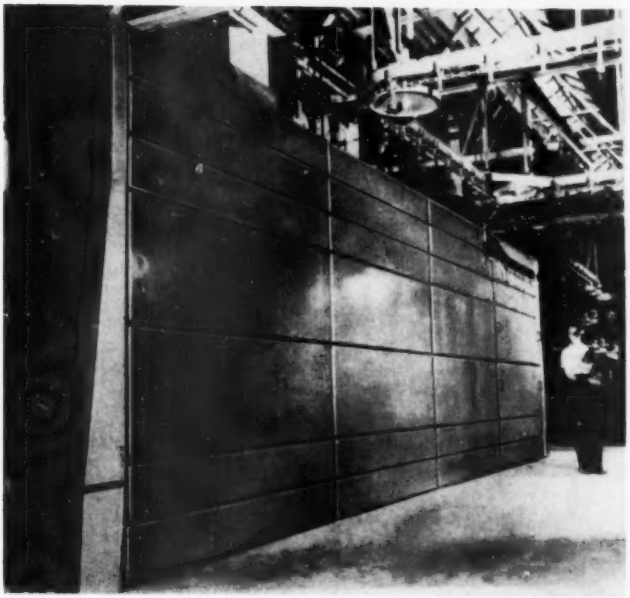
IT'S YOUR BEST BUY FOR PLANT SUPPLY
Specify Gold Seal Tape and save.

FRICTION AND RUBBER TAPES
In either 10-roll cartons or single rolls. Every roll sealed in cellophane, stays fresh. Jenkins Bros., (Rubber Division), 100 Park Ave., New York 17.

Jenkins Bros. also make Diamond Seal Friction and Rubber Tapes which meet ASTM and Federal Specifications.

A PRODUCT OF JENKINS BROS. . . . MAKERS OF FAMOUS JENKINS VALVES

Practical Methods



ELECTRIC OVEN at Metal Mouldings Corp. utilizes Calrod tubular heaters and aluminum reflectors to control the radiant energy; is entirely automatic except for loading and unloading; and requires about 25% of space needed for convection type ovens.

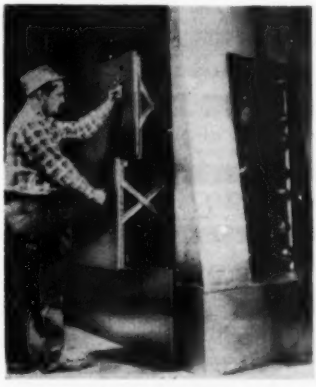
Electric Radiant Ovens Speed Process Heating

PRODUCTION

Thousands of automobile accessories and trim parts are washed, dried and given three coats of baked-on finish in four new prefabricated electric ovens at the Detroit, Michigan, plant of the Metal Mouldings Corp. These ovens, designed and built by Jensen Specialties, Inc., utilize electric radiant heating panels with heat capacity of 4 to 40 kw at 800 to 8000 Btu/hour/sq. ft., and have provided increased production in this installation.

This process heating system is entirely automatic except for loading and unloading. The ovens occupy only 624 square feet of floor space, which is about 25% of the floor space requirement for convection type ovens. With a 700-foot monorail conveyor, the complete electro-static spray painted system requires only 63 by 72 feet of space, with 13 feet of headroom.

The heating elements in the radiant units are General Electric Calrod tubular, plug-in, lock-in type heaters,



HEATER PANELS open easily for oven inspection and maintenance; are 26 inches by 84 inches, rated 4 to 40 kw.

with a normal life in excess of 8000 hours. These heaters are mounted in wall panels through a rapid temperature elevation zone, and all panels open outwardly to facilitate servicing of all electrical parts from outside the oven. For the temperature holding zones, finned Calrod heaters provide instrument-controlled convection.

Control of the system is provided through a master electrical control panel, which allows sequence starting. In the event a fault condition develops in the system, shut-down is automatic. In this way, stripping and refinishing of production parts is avoided.

The heaters and their lock-in type receptacles permit all electrical connections to be made outside the heating zone, and thermal losses are reduced by the design of the unit. Cold sections in the heaters prevent heat loss through the insulated walls and at the supporting points, thereby insuring quick on-and-off heat response. And special lifetime aluminum reflectors control the radiant energy delivered by the heaters.

Cable Troughs By-Pass Feeder Obstacles

CONSTRUCTION

Changing over the electrical system at Chicago's Drake Hotel from direct current to alternating current service was primarily a new service and feeder project. The design of Ralph H. Decker, consulting electrical engineer on the project, called for installation of more than 170 feeders, most of which consisted of 500MCM, 3-phase, 4-wire circuits in 3½-in. conduits.

Obstacles to a free-way for electrical circuits is always a problem, even in newly constructed buildings. In an existing structure, this problem is multiplied many-fold by structural conditions and existing piping to serve other facilities. Fischbach, Moore & Morrissey, Chicago electrical contractors on the job, found this condition in the engine room of the hotel. It was their responsibility to get these secondary distribution feeders from the dual switchboard over to each end of the building where groups of risers were to carry service to all floors.

Carefully designed pull boxes mounted at points where elevation changed or feeder routing shifted, made the installation of multiple conduits relatively easy for one half of the building. The real trouble came on the engine room side of the switchboard. The ceiling already was over-

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Take a Tip!

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ANCHORING and DRILLING DEVICES

When making *Fastenings* to masonry

Sold Through Distributors only

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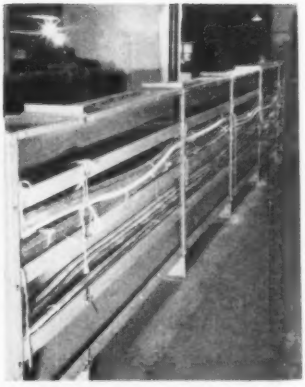
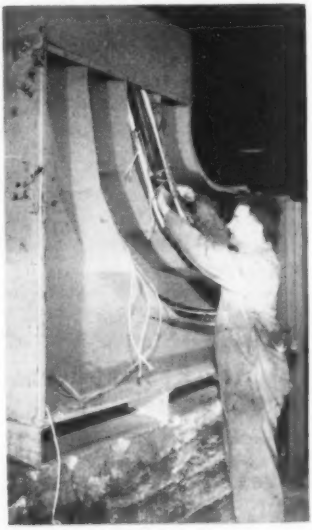


FOUR-TIER VERTICAL trough, securely bolted to concrete floor, carries groups of 500MCM feeder circuits past structural and piping obstacles in engine room.

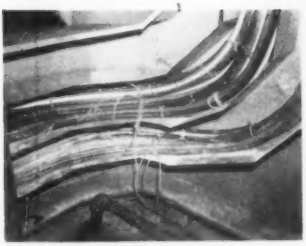


CIRCUIT ROUTING shifts to single-tier overhead trough at switchboard location. End section has curved steel partitions to support cables.

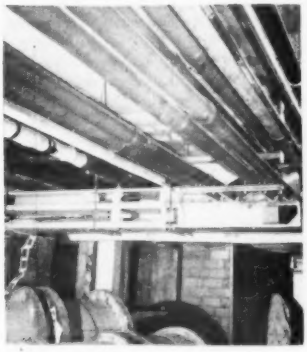
crowded with all types of service facilities.

F. M. & M. engineers solved the problem by designing a heavy steel, four-tier, wiring trough with removable screw-cover panels along the accessible face. The long trough was mounted to double channel-iron "blocks" bolted to the floor.

At the switchboard end, the four-tier vertical trough changes direction and becomes a single-tier overhead trough which carries the circuits, at right angles, to the switchboard header box. At the opposite end, a similar trough section incorporates an addi-



WIDE SWEEP OF trough section at opposite end carries cables around double right-angle offset to second overhead single-tier trough.



DISTRIBUTION PULL BOX and associated double-tier trough outside engine room carries circuits to riser shaft locations.

tional offset to carry the cables up to ceiling height to a distribution pull box outside the engine room wall.

Curved steel dividing partitions separate and support the groups of cables at these corner sections. The accompanying photographs show the conductors being tied together as a temporary measure until suitable brackets are installed.

Metal Hose Protects TV-Tower Wiring

WIRING

A new heavy duty, flexible metal hose was recently developed to solve a knotty technical problem in the construction of the new TV antenna tower atop the Empire State Building in New York City. This metal hose was selected for use in the tower only after an exhaustive quest for a suitable weatherproof cable covering which would satisfy the many conflicting requirements of antenna engineers and tower design experts.

Mechanical and electrical considerations had to be carefully reconciled in running the multiplicity of electri-

LATROBE

FLOOR BOXES — WIRING SPECIALTIES

PRODUCTS

QUALITY THAT LASTS

No. 252-R Two Gang Adjustable Floor Box

Neat and practical with No. 208 Receptacle in one section. One Cover Plate has ½" Flush Brass Plug; other has 2".

No. 140 Floor Box
No. 206 Nozzle

Soundly constructed with 4 ¼" Cover Plate and large Adjusting Ring No. 215. Can be very quickly installed.

Compact — Economical

"Latrobe" Floor Boxes and Wiring Specialties are designed for quick, easy installation and superior performance. Stripped of frills and complex assembly, "Latrobe" Products do their job smoothly and economically.

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No. 110 "Latrobe" Watertight Box

Unique, compact design unexcelled for service in concrete or wood-finished concrete floors. Cover Plate 3½" diam.

No. 284 Nozzle
No. 200 Cover Plate

Furnished with ⅛" or ¾" brass pipe extension, this trim Duplex Receptacle Nozzle is built for dependable service.

Cable Staples

Millions of these high quality staples are in use all over the country. Packed in cartons, kegs or barrels.

"Bull Dog" Insulator Supports

Safe and sure for clamping porcelain or glass insulators to exposed steel frame work. Four sizes.

EASILY INSTALLED

FULLMAN MANUFACTURING CO. LATROBE, PA.

ECONOMICAL

With a

QUIJADA CHIEF

PIPE AND BOLT THREADER

Check these average QUIJADA threading times against your present methods

CONDUIT SIZE	½"	1"	1½"	2"
THREADING TIME	11 sec.	17 sec.	20 sec.	23 sec.
REAMING TIME	You ream as you thread			
CUTTING TIME	5 sec.	5 sec.	7 sec.	9 sec.
TOTAL TIME	16 sec.	22 sec.	27 sec.	32 sec.

QUIJADA SPEED KEEPS YOU HIGHLY COMPETITIVE!

Compare the time totals shown on this table with your present threading, reaming and cutting time. See for yourself how much you can save on each job.

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5474 Alhambra Avenue
Los Angeles 32, California

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ADDRESS.....

CITY.....ZONE....STATE.....

cal circuits throughout this tower which provides transmitting antenna systems for five television stations. The addition of the 220 feet of antenna loaded structure, with a base only 8 feet square, to the existing 1250 feet of building height limited the maximum allowable wind and ice loads. This necessitated a careful balance between the amount of cable runs and the spacing of the runs within the tower framework. The tower had to accommodate r. f. transmission lines for 13 different radio transmitters to be operated simultaneously into 108 dipole antenna elements. In addition, each station required further special electrical circuits to serve its antenna area.

It was finally decided that the 12 main and 102 branch transmission lines for the radio signal requirements would be run in the open area at the center of the tower. To minimize the wind and ice loading on the tower, the remaining circuits, comprising obstruction and service lighting and receptacles, de-icing circuits, and communications and monitoring circuits, were required to be run inside the four 6-inch corner angles of the tower. To provide satisfactory running of these circuits in the angles of the vertical structural members, the new flexible metal hose was developed by the American Metal Hose Co., Inc., New York, N. Y.

COMMUNAL TV SYSTEM atop the Empire State Building required a maze of electrical circuits within the 220 foot open steel structure. Flexible metal hose solved the problem of running these circuits.

FLEXIBLE HOSE adjusted to the surface contour within the corner angles of the vertical structural members of the tower; easily by-passed splice plates, rivet heads and structural braces.

This flexible metal hose offered long life and complete protection of the wiring against weather, abrasion and corrosion. In addition, its flexibility facilitated mounting of the cables, in spite of the constricted and devious corner angle path up the tower. Because of the amount of bending required to by-pass splice plates, rivet heads, diagonal braces and tower diaphragms along the cable path, rigid conduit was totally inadequate. Other types of flexible conduits and cables were also eliminated because of various conflicts with the Electrical Code and the requirements of the broadcast system. From every standpoint, however, the flexible hose proved to be the ideal solution to the problem.

Rig Twists Conductors Into Service Cable

CONSTRUCTION

A bit of old fashioned mechanical ingenuity recently fashioned a cabler "Maypole" from an assortment of odds and ends which might be found in any motor shop. This machine was built to handle a problem which was given to the crew at the Consolidated Edison cable salvage shop in New York City.

Because of the shortage of copper service cable, the salvage shop was asked to twist some 55,000 feet of

where power is part of the product,

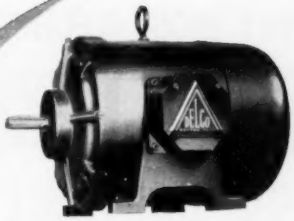
you're right with a

DELCO

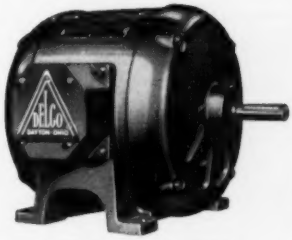
When you need motors—to serve as a *part* of your product or to help you *make* your product—look to Delco for the motors that will serve you best.

Delco produces motors for practically every known purpose . . . and each Delco motor is *engineered* for the kind of work it has to do. It's made of the finest materials, and constructed to stand up longer under the roughest conditions.

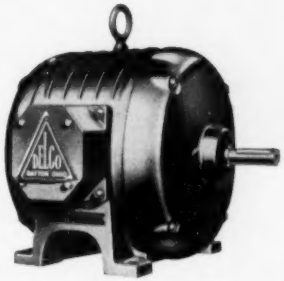
So check on Delco. You'll find Delco motors fit your needs, and that Delco always delivers on time. For complete details, write to Delco Products, Dayton, Ohio, or call the nearest sales office listed below.



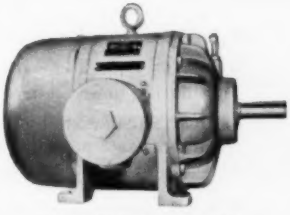
TOTALLY ENCLOSED FAN-COOLED MOTOR



OPEN BALL-BEARING MOTOR



TOTALLY ENCLOSED MOTOR



EXPLOSION-RESISTANT MOTOR

DELCO PRODUCTS

Division of General Motors Corporation
Dayton, Ohio

DELCO DAYTON OHIO

SALES OFFICES:
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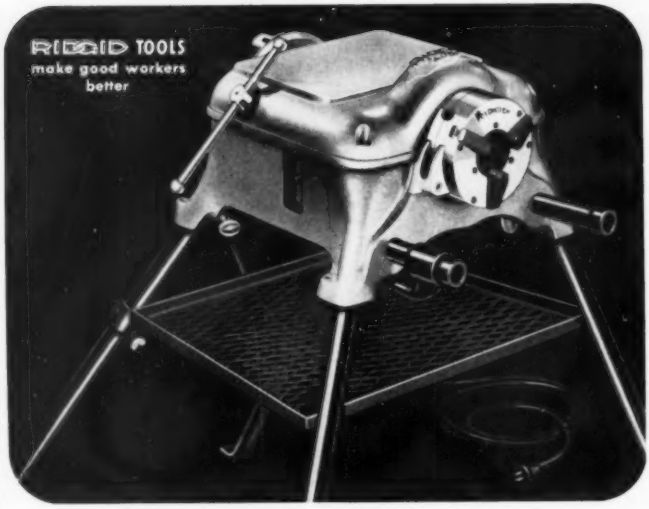
DELCO FEATURES MAKE DELCO FINEST

WHY MOST ELECTRICIANS Demand

RIDGID

"400" PORTABLE POWER DRIVE



RIDGID *"400"—bench model or stand with tray, capacity ⅛" to 2"—to 12" with geared tools.*

Time-and-work-saving power for hand threaders, cutters, reamers

★ Extra light-weight unit—one man can handle it.

★ Lots of power—universal motor, forward, reverse, won't bog down on large pipe.

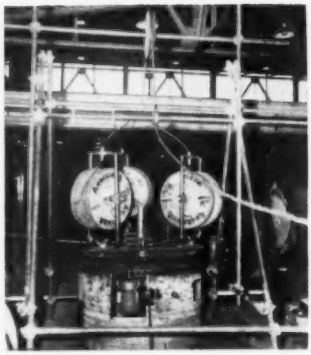
★ RIDGID design 3-jaw chuck, chuck wrench ejector; self-centering workholder in rear turns with pipe.

★ Sealed-in lubrication—no oil to spill.

★ See the remarkable "400" at your Supply House!

THE RIDGE TOOL COMPANY • ELYRIA, OHIO

★★★ RIDGID Work-Saver Pipe Tools ★★★



MAKESHIFT CABLER was made from an assortment of spare parts to twist 55,000 feet of single conductor No. 4 aluminum wire into two- and three-conductor service cable; provided inexpensive but effective mechanized operation.

single conductor No. 4 aluminum wire into some two- and three-conductor service cable. The size of this job was sufficient to justify a mechanized operation; but since the need for a cable twisting machine would be non-existent after the job, it was necessary to construct an inexpensive machine.

Starting with an old sand blast table as a base, the shop crew built such a machine with a minimum amount of spare parts. On top of the sand blast table, an old cable reel hub with a chain belt secured to its circumference is rotated by a motor driven pinion which meshes with the chain belt. The motor is mounted on the side of the table. On top of the hub, three pipe frames support three reels of the single conductor aluminum wire. Each frame is mounted on a gear; each gear is driven by chain connection to the geared rotation axis of the hub.

When the hub is rotated, the conductors are fed into a twist through a forming ring above the machine. Further, the geared relationship between the reel frames translates the hub rotation into an axial rotation for each reel frame, thereby relieving torsional strain on the individual conductors. A tension on the service cable assures the proper tightness of twist, for either 2- or 3-conductor cable.

A simple pipe frame is set up around the machine to facilitate forming the cable. On the cross bar of this frame, above the center of the sand blast table, a small forming ring is mounted. The single conductor wire passes through this ring as it is twisted into the cable. The formed cable is then pulled over a low hanging pulley.

Although the assembly was completely makeshift, a great saving in time and effort was effected; and the results were excellent.

for

surface

installation,

anywhere.

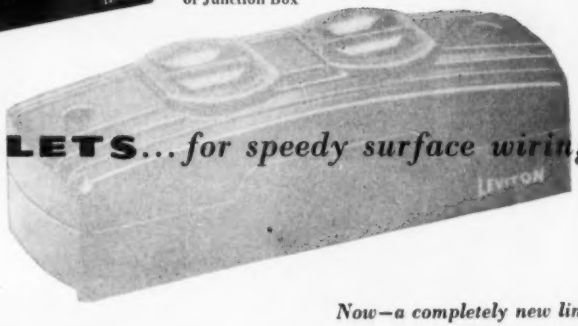
No. 5230
Duplex

No. 5231
Single Pole Switch

No. 5233
3 Way Switch

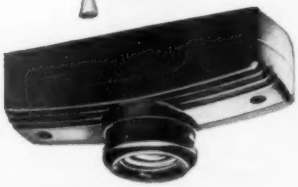
No. 5237
Rosette
or Junction Box

LEV·O·LETS... *for speedy surface wiring*



Now—a completely new line of surface wiring devices—bases and covers are made in Urea Plastic —for Non-Metallic or B-X Cable wiring. Complete wiring instructions in each box. Send for additional information.

No. 5235
Pull Chain



No. 5236
Keyless

LEVITON

LEVITON MANUFACTURING COMPANY

brooklyn 22, new york • chicago • los angeles

SURE CURE

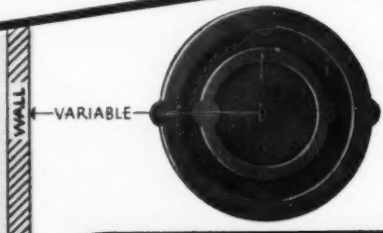
SQUARE D's MATCHING KNOCKOUTS

for faster, easier, neater GANGING

...no time-consuming conduit bending

—an EXCLUSIVE feature of Square D safety switches—circuit breakers—starters—contactors—auxiliary gutters

Bending conduit is a familiar scene when electrical devices of varying sizes and makes are being connected. This costly operation can't be avoided if conventional concentric knockouts are used. The sketches show why.



WITH CONVENTIONAL CONCENTRIC KNOCKOUTS *BENDING* IS A "MUST"

Conventional concentric arrangement provides knockouts of various sizes, grouped around a common center, which must be positioned far enough from the rear of the enclosure to permit installation of the largest conduit size. Therefore, the distance from the rear of the enclosure is variable, depending on the combination of knockouts in each cluster. The size of the cluster required changes with device rating.

Expensive—Unattractive!

SQUARE D COMPANY

DETROIT · MILWAUKEE · LOS ANGELES

SQUARE D COMPANY CANADA LTD., TORONTO • SQUARE D de MEXICO, S.A., MEXICO CITY, D.

for the "BENDS"

WITH MATCHING TANGENT KNOCKOUTS —STRAIGHT, NEAT CONNECTIONS

Square D's new tangent arrangement provides ½"-¾" concentric knockouts with larger knockouts in a tangent pattern. The common center of the two smaller knockouts is a constant distance from the rear of the enclosure. This automatically positions the tangent pattern, thus insuring matching knockouts regardless of size of cluster or device rating.

Economical— Attractive!

More good reasons for specifying Square D's electrical distribution and control equipment, straight across the board—less expensive to install and more attractive in appearance.

ASK YOUR ELECTRICAL DISTRIBUTOR FOR SQUARE D PRODUCTS

You can REDUCE equipment failure

● Use Electro Custom Processed Varnished Insulation to INCREASE LIFE EXPECTANCY and to *insure* the *safe, successful operation* of *electrical equipment.*

Selecting dependable insulation need not present any problem to design, insulation and maintenance engineers if they specify ELECTRO. Our method of processing produces varnished insulation with the ESSENTIAL SAFETY FACTORS.

You may buy with confidence when you buy these

ELECTRO

TECHNICAL PRODUCTS

- Silicone Varnished Fiberglas*
- Quin-Glas Hi-Temperature Insulation
- Varnished Fiberglas* Cloth
- Electro "300" Combination Slot Insulation
- Treated Asbestos Cloth & Paper
- Flexible Varnished Cambric Tape
- Varnished Condenser Paper
- Varnished Silk and Rayon
- Cable Wrapping Tapes

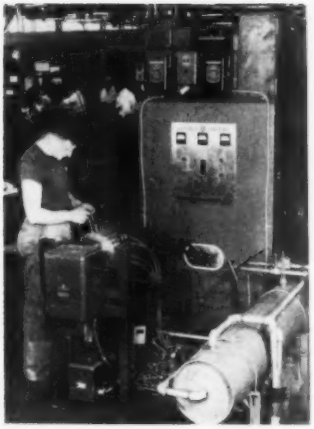
We invite you to use our Special Service facilities if you need varnished insulation to meet specific requirements. Write or phone Department E-1 for technical data and samples.

ELECTRO-TECHNICAL PRODUCTS

DIVISION OF SUN CHEMICAL CORPORATION

NUTLEY 10, NEW JERSEY

*T. M. Reg. U. S. Pat. Off. by Owens Corning Fiberglas Corp.



INDUCTION HEATER for hardening engine valve-tips provides many advantages over the previous oxy-acetylene method, increasing production and improving the quality of the product.

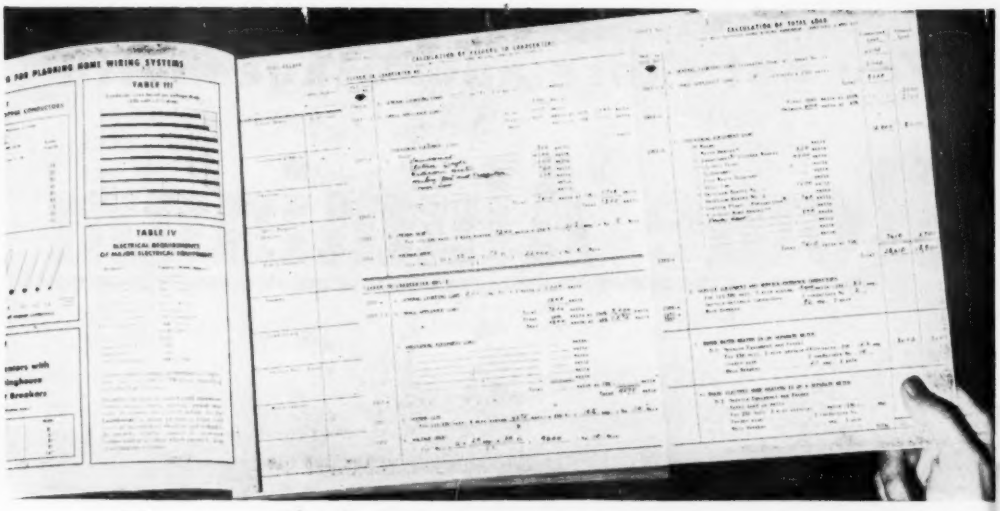
Induction Heater For Valve-Tip Hardening

PRODUCTION

One of the largest engine valve manufacturing firms recently reduced valve-tip hardening costs 30% with a 20 kw electronic induction heater. In the first three months of use, the unit effected a great improvement in the heat-treated product by providing controlled input and time under heat. The engineers at the firm, the Thompson Products Company of Cleveland, Ohio, found that more consistent heating, hardness and hardness depth in treated valves were the advantages of this method over the previous oxy-acetylene torch method, which was a non-uniform heating process requiring considerable care and attention.

The old operation was not suited to increasing demands for larger production. In this operation, the valve was set in water with the tip protruding above the water line. Oxy-acetylene torches were locked into position and the valves were indexed in line for heat treating by means of an automatic chain conveyor belt. The cost of this process and the inspections it required was high and had to be eliminated to maintain a marketable price on the product.

To solve these many problems, the General Electric induction heater was installed. In addition to increasing production, the new unit provided an improvement in valve quality to meet the requirements of the higher combustion temperatures incorporated in modern engine designs. The complete new operation has made the product far more easily marketable.



A NEW "TOOL" that saves estimating time

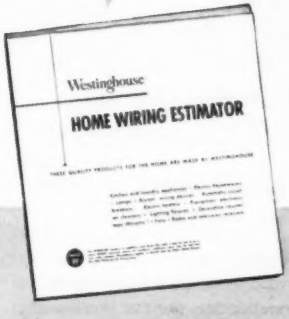
. . . assures more accurate results

Electrical contractors have long felt the need for a simple set of forms that would permit them to quickly and easily compute an "engineered home wiring" system, and make sure that every phase of the job would be included.

The Westinghouse Home Wiring Estimator is the answer to this need . . . step-by-step the number and types of circuits are readily determined, total loads computed, as well as other information so necessary in planning an "engineered wiring system".

With the Estimator you can "sell" customers on an "engineered wiring system". You can show why a given number of circuits are needed; . . . why the size of electrical conductors, etc. It will help make sure that competitive figures are on a comparable basis.

The Estimator includes several helpful tables and 25 sets of work sheets. A sample computation shows the procedure. Price, 25¢ . . . Send for a copy and use it on your next job. G-10186-B



YOU CAN BE SURE...IF IT'S

Westinghouse

Better Homes Dept. EC-4
Westinghouse Electric Corp.
P. O. Box 868, Pittsburgh 30, Pa.

Please send me a copy of your new "Home Wiring Estimator" SA-6815. I enclose 25¢.

Name_____

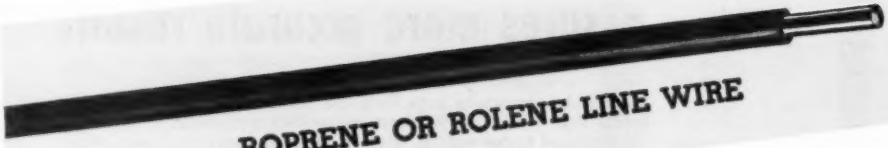
Address_____

City_____ Zone____ State_____

You get these advantages with

Rome Aluminum

ROPRENE SELF-SUPPORTING SERVICE DROP CABLE



ROPRENE OR ROLENE LINE WIRE

3 BIG REASONS...

Why you are bound to save money with Rome Aluminum Self-Supporting Service Drop Cable and Rome Aluminum Line Wire ... lower purchase cost ... lower installation costs ... longer service life.

Lower purchase cost... Depending upon the service involved, aluminum conductors cost less today.

Lower installation costs... Aluminum's lighter weight means easier and cheaper handling ... in many instances permits longer spans with fewer poles. The simplicity of Rome's Self-Supporting Cable construction means increased savings through cheaper hardware and ease of installation.

Longer service life... Aluminum has proved itself as a long-life conductor material. RoPrene (Neoprene) as well as RoLene (polyethylene) as either insulation or covering has exceptional resistance to sunlight, moisture, corrosive atmospheres and abrasion. With no braids to rot and festoon, replacement is minimized.

Rome Aluminum Self-Supporting Service Drop Cable is regularly supplied with two RoPrene (Neoprene) insulated power conductors of solid aluminum, spiralled around a bare neutral messenger of ACSR (aluminum conductor steel reinforced). This time-proven construction provides high strength, simplicity of installation.

Rome Aluminum Line Wire is available with covering of RoPrene (Neoprene) or RoLene (polyethylene) as specified. Here is low cost Line Wire having ease of handling, as well as long, non-festooning service life. Uniformly small diameters provide neater appearance, plus reduced wind and ice loading.

It Costs Less to Buy the Best

Rome ALUMINUM

ROME CABLE CORPORATION, ROME, N.Y., AND TORRANCE, CALIF.

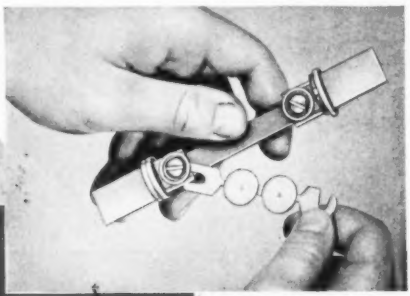
1-2-3

Here's all you do...

1. Unscrew cap and let blown fuse-link pieces drop out.
2. Insert new fuse link. It aligns itself automatically.
3. Replace cap.

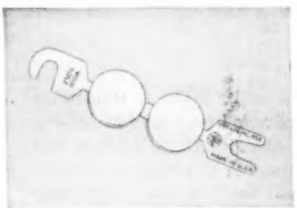
It's that simple to renew these G-E ferrule-type fuses. No need to juggle small parts, no fussing with alignment, no time wasted. Just 1-2-3 and the fuse is back on the job.

With the knife-blade type, you simply slip a new link under the clamping screws and tighten. Then replace the knife-blade and screw on the cap.



Renewable TIME-DELAY FUSES

CUT DOWNTIME THIS EASY WAY



Wide sections of G-E fuse links dissipate heat of harmless, momentary overloads — give measured time-delay. Narrow sections blow fast to cut off dangerous surges.

Plan now to reduce the downtime that's caused by unnecessary fuse renewals. G-E time-delay fuses let harmless momentary overloads pass, blow fast to cut off shorts or dangerous overloads.

So, for full-time operation—with no unnecessary fuse replacements—get the fuse that's designed to cut downtime. Get G-E renewable time-delay fuses.

For complete data, address Section D2-418, Construction Materials Division, General Electric Company, Bridgeport 2, Conn.

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GENERAL ELECTRIC

NEW PRODUCTS
CATALOGS, BULLETINS
ADVERTISEMENTS

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For further information on new products, trade literature and advertising appearing in this issue—

After the words "Item Number"—Just insert the numbers of any items appearing on the pages under PRODUCT NEWS, PRODUCT BRIEFS and CATALOGS, BULLETINS AND ENGINEERING DATA. Use the boxes provided.

After the words "Advertisement on Page"—Insert in the boxes the page numbers of any advertisements about which you want to know more. Where more than one advertisement appears on a page, include the manufacturers initials.

Please send me without obligation, further information about the following:

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Do you have a problem in wiring layout, motor control, lighting methods, code interpretation? For sound technical advice

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Product News

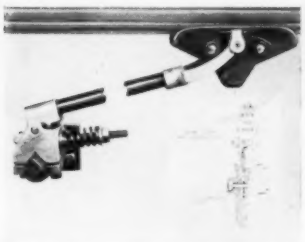
FHP Motors (1)

A new line of fractional horsepower motors embodying an entirely new concept of motor design has been announced. Designated as "Form G", the new motor weighs as much as 51% less per hp than the models it replaces and is considerably smaller in size. Motors are available in open dripproof and totally enclosed fan-cooled models. Type K (polyphase) delivers constant speed for all standard applications where two or three-phase power is used on pumps, compressors, fans, blowers, and other equipment. Type KC (capacitor start) is for domestic water pumping, farm and dairy equipment, commercial refrigeration, air conditioning, motorized tools, etc., where high starting torque under heavily loaded conditions is required. Type KH (split phase) is for fans, blowers, centrifugal pumps, oil burners, ironers, office appliance, and many other general applications where moderate starting torque and smooth performance is needed. Type KCP (permanent split capacitor) is for shaft-mounted fans and blowers where quiet, multi-speed operation under constant load is desired.

The design incorporates a new insulation system consisting of a special nylon material scientifically combined with Formex wire and Glyptal varnish to give motors longer life. Improved double-end ventilation keeps the Form G open dripproof motor cool under continuous loads and deters accumulation of dirt inside the motor. Leads are of a new braidless neoprene.

It is the first general-purpose sleeve-bearing motor recommended for all-angle operation, and is capable of absorbing moderate thrust loads. Both solid and resilient mounted Form G motors are fitted with an improved type of strap base. Open dripproof motors may be rotated in the base cradle as desired. Base and shell of motor are of welded steel and will hold the motor in proper alignment in any mounting position.

General Electric Company, Schenectady 5, N. Y.



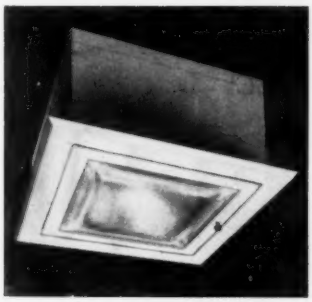
Wiring System (2)

A new trolley system, designed to insulate bare figure-8-bar conductors has been announced. Known as "Insul-8-Bar" it can be applied to existing figure-8-bar conductors without dismantling, or it can be installed as a new system. Basically, the system consists of two units: (1) a sheath of insulation material, readily cut to any desired length, that snaps over the 8-bar conductor; (2) a sliding shoe collector, held against the insulated 8-bar conductor by spring action (adjustable from 2 to 10 pounds pressure.) Sliding shoe makes contact with conductor through a continuous, narrow opening at bottom of insulation sheath. It is adapted to curves, switches and crossovers. Present system, rated to 60 amperes, is designed specifically for standard, 1 inch figure-8-bar conductors.

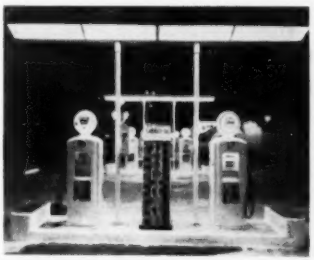
Benbow Manufacturing Co., 1285 Rollins Road, Burlingame, Calif.

Downlight (3)

A new 2450 downlight incandescent unit, especially designed for recessing into ceilings, has been announced. Its low brightness, diffused illumination makes it suitable for corridors, lobbies, and similar locations in hospitals, schools, motels, hotels and private dwellings. Requiring 5½ inches of space above the ceiling line, it can be fitted into a 10-inch square opening. Overall size of unit including ceiling flanges is 12½ inches square. An 8½-inch square glass lens-panel which diffuses the light source, is mounted in a metal frame that hinges open. Maximum lamp size is 150 watts. A companion unit, the 2458 downlight, in addition to the regular socket is equipped with another socket fitting a lamp up to 15 watts for use as a night light. Both units are UL approved.



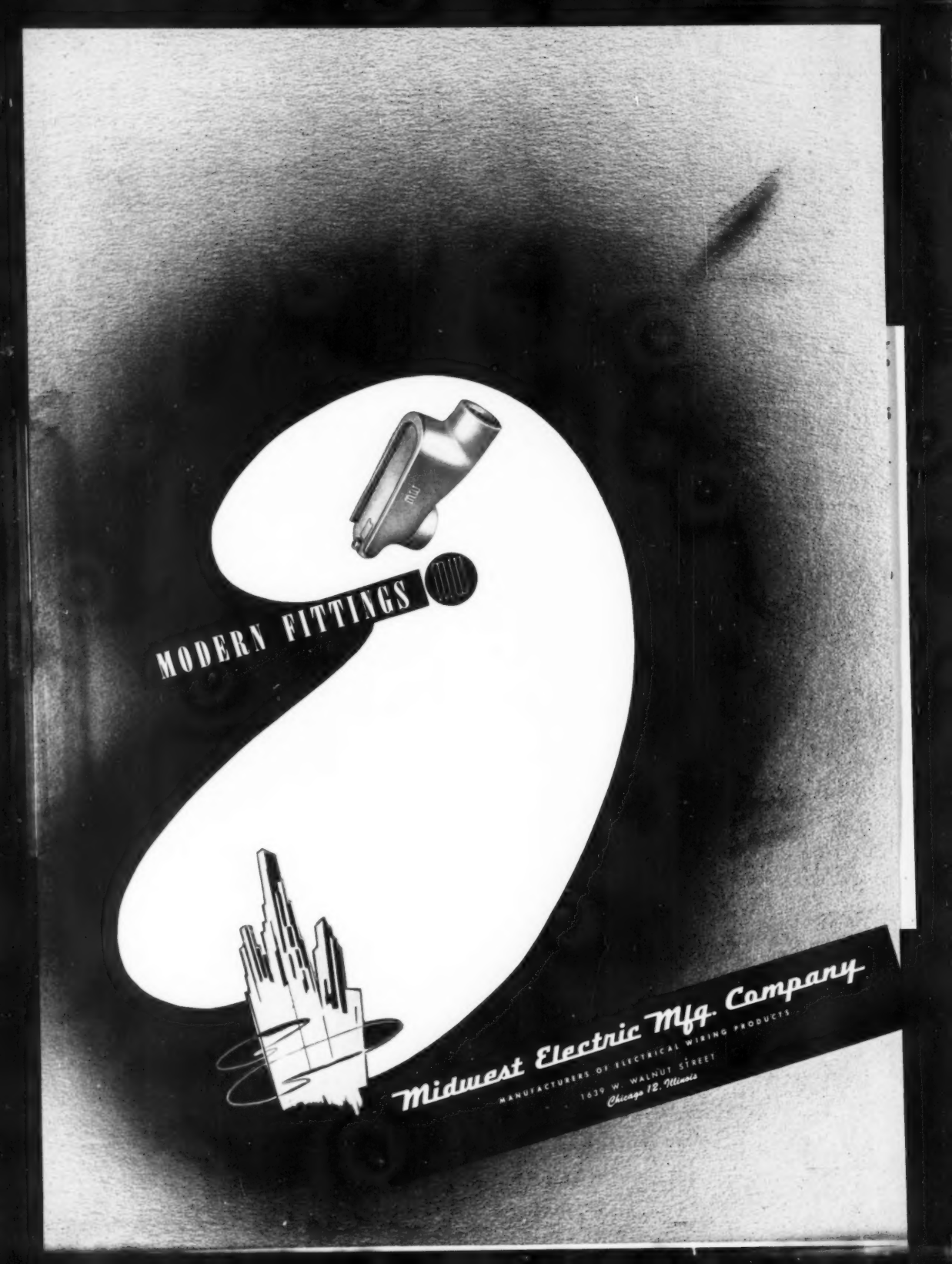
Pittsburgh Reflector Company, 404 Oliver Bldg., Pittsburgh 22, Pa.



Lighting Fixture (4)

A new fluorescent overhead island for gas stations has been developed. Known as "Station Master", they are designed for overhead island illumination, delivering high intensity of light at the selling zone, without creating a barrier of glare. Outdoor construction assures dependable performance under all weather conditions. Mounting sleeve of cast iron, is attached to unit for installation. Three inch pipe mounting columns (recommended mounting height above ground 10 ft.) Corning Albalite glass panels are mounted in waterproof hinged frames, held against wind pressure and vibration by thumb screws. Frame swings open for cleaning and re-lamping. Units in 4-, 8- or 16-ft. lengths.

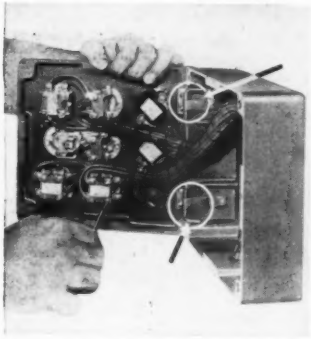
Leader Electric Company, 3500 N. Kedzie Ave., Chicago 18, Ill.


MODERN FITTINGS
Midwest Electric Mfg. Company
MANUFACTURERS OF ELECTRICAL WIRING PRODUCTS
1639 W. WALNUT STREET
Chicago 12, Illinois

Industrial Fixture (5)

A new industrial luminaire, 2FPR-90, is now available. It is suitable for the operation of two T-17 mogul fluorescent lamps rated at 85, 90, or 100 watts. One of the new features is a rigid lampholder support, a gusseted section which covers more than half of the socket and assures accurate lampholder spacing. A snap-in chain mounting bracket permits suspension from either one or two points. Bracket is inserted in knockout slots in top of unit by pressing it through from the inside. Luminaire is also equipped with indexed starters, indicating lamp operated by respective starters.

Westinghouse Electric Corporation, Pittsburgh 30, Pa.



Control Station (6)

A newly designed oil-tight control station in 6, 9, 12 and 16 unit sizes, featuring a hinged cover to facilitate wiring and maintenance of individual oil-tight control units has been announced. This line supplements the 1, 2, 3 and 4 unit enclosures. Designed for machine tool service, the cast enclosure is provided with a composition gasket between box and cover to insure an oil-tight seal. Both box and individual units mounted within are constructed so that cutting oils, coolants, moisture and dust found in machine tool applications cannot enter from front of enclosure, through control units or through enclosure mounting holes. A sliding internal hinge arrangement makes it possible to obtain the advantages of hinged cover construction. Hinge pins are removed when mounting control units to cover. Boxes are provided with bosses for conduit entry at convenient locations. A complete line of individual oil-tight control units including pushbuttons, selector switches, selector pushbuttons, pilot lights, attachments and accessories is available for mounting in these enclosures.

Square D Company, 4041 North Richards St., Milwaukee 12, Wis.

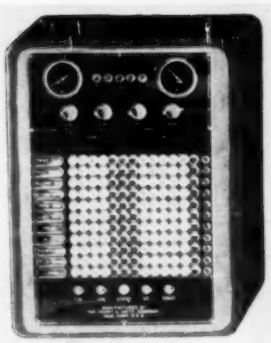
Fan (7)

Announcement has been made of a heavy duty belt driven fan, with motor outside of air stream, for use in paint spray booth, large range hood exhausters, or in ventilating or heating systems. Recommended for air movement up to 350°F. Fan will operate against moderate static pressure up to 2 inches. Equipped with non-overloading cast aluminum airfoil type propellers. Units are ball bearing and motors are semi-enclosed or explosion-proof, as required. Hoods can be supplied for outside mounting. Units available in sizes from 16-in. to 36-in. and air deliveries from 2700 to 23,000 cubic feet per minute.

Chelsea Fan & Blower Co., Inc., 639 South Avenue, Plainfield, N. J.

Timer (8)

Cat. 125 timed operations preselector is a new type of timer. It provides for adjusting the timing of each cycle of a process independently. It can be used to energize a number of electrical devices or circuits during a single cycle of a process. Unit illustrated is for use on laundry machinery. It selects the time, temperature, and water level of each of 11 wash cycles. It has contacts available to provide pilot light indications of circuits, and means of starting and stopping the washer motor. It consists of a single synchronous motor timer which delivers a repetitious fixed time impulse. Any multiple of this impulse can be preselected by means of pushbuttons for the desired time interval of each cycle. Operates on ac or dc.



Henry G. Dietz Company, 12-16 Astoria Blvd., Long Island City 2, N. Y.

Variable Speed Units (9)

The addition of Type KFEA variable speed units with reduction gears in ratings of 20 and 25 hp, has been announced. Units are available in speeds of 728 r.p.m. and lower with infinite speed adjustment within the ranges of 2:1, 3:1 or 4:1. Illustrated is one of the 25 hp single reduction models with a speed variation of 4:1 and output speeds of 324 r.p.m. down to 81 r.p.m. Features of drive are: positive adjustment of pulleys, accurate maintenance of speeds under varying loads, belt tension in proportion to load, positive oil seals, single train helical gears, Herringbone rotor, and direct-through ventilation. All ratings are available with drip-proof or splash-proof construction.

Sterling Electric Motors, Inc., 5401 Anaheim-Telegraph Road, Los Angeles 22, Calif.

TYPE C

General purpose transformers, 600 volts and below; 1-15 KVA inclusive, single or three phase

HIGH efficiency

MARCUS DRY TYPE transformers

450 KVA, Type F Unit Substation, 4160 V. Delta, 60 Cycles, 3 Ø—120/208Y, 4 wire.

LOW maintenance

1500 KVA, Type F Unit Substation, 4800 V Delta 60 Cy, 3 Ø—120/208Y, 4 wire.

Years of specialization in the dry type transformer field have resulted in a far superior product. Being ahead of the rest of the field is the natural result of continuous effort and research in uncovering new materials which are your constant assurance of maximum transformer value.

MARCUS DRY TYPE, AIR-COOLED TRANSFORMERS

ARE SAFE — No explosion or fire hazards. No fire proof vaults. Class B and C heat proof insulations.

ARE ECONOMICAL — Lower cost installation and operation, negligible maintenance.

For the transformer that's second to none, specify MARCUS.

ONE OF THE WORLD'S LARGEST MANUFACTURERS OF DRY TYPE TRANSFORMERS EXCLUSIVELY

1 to 2,000 KVA up to 15,000 Volts to meet Individual Requirements

- DISTRIBUTION
- GENERAL PURPOSE
- UNIT SUBSTATION
- PHASE CHANGING
- ELECTRIC FURNACE
- RECTIFIER
- WELDING
- MOTOR STARTING
- SPECIAL

NEMA

Representatives in Principal Cities

MARCUS TRANSFORMERS CONFORM TO THE STANDARDS OF N.E.M.A. AND A.I.E.E.

MTC

MARCUS TRANSFORMER CO. INC.

39 MONTGOMERY STREET

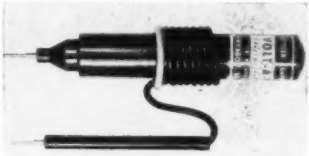
HILLSIDE 5, NEW JERSEY

PIONEERS IN THE FIELD OF AIR-COOLED TRANSFORMERS

Meter Mounting Device (10)

A new heavy duty meter mounting device, capacity up to 200 amperes has been announced. This device can be used with any standard 4 or 5 terminal self contained socket type meter —single phase 3-wire network, or 3-phase 3-wire. Bolt type pressure connectors take line conductor sizes from Nos. 6 to 4/0. Unit is equipped with a transparent acetate shield for safety during installation or testing. By-pass clamps permit removal or testing of meter without interrupting the load. Corrosion resistant, weatherproof case, measuring 9-in. by 18-in. by 4½-in., can be supplied with 2-in. or 2½-in. threaded hubs and 2½-in. K.O.'s in the bottom, and ½-in. and ¾-in. K.O.'s for optional grounding at meter enclosure. Unit may be mounted in gang for multiple high capacity meter installations.

Murray Manufacturing Corp., 1250 *Atlantic Ave., Brooklyn* 16, *N. Y.*



Voltage Tester (11)

A new voltage tester with safety features has been introduced. Called "Volt-A-Test", it is designed to give voltage readings up to 575 volts ac and 600 volt dc. Three separately insulated coils, connected in series, provide safe-to-use factor. Coil terminals are separated by the full length of coil, since circuit is brought in at one end of tester and out the other, making a "straight-through" circuit. Only one test prod is required, the unit itself forming the other lead. While the tester is in use, the voltage indicator, located at the end of the case, comes into full view.

Sittler Corporation, 18 *North Ada St., Chicago* 7, *Ill.*

Portable Heater (12)

A new, portable pail heater has been introduced. Consisting of a copper-sheathed electric element rated at 120 volts, 1500 watts, and an automatic safety switch, the heater is turned on by hanging pail on switch lever. Current goes off when pail is removed or when water boils down to heating element level. It is approved by Underwriters' Laboratories. Uses include warming water for cattle feed, poultry fountains, cleaning milkhouse utensils, extra hot water for home laundering; and for outdoor requirements—around garages, stores, trailer camps, or cottages, or wherever hot water is needed periodically.

Edwin L. Wiegand Co., 7637 Thomas Blvd., Pittsburgh 8, Pa.

Insulation Tester (13)

A new insulation tester has been developed. The indicator is a direct reading dc microammeter, is calibrated directly in megohms and will measure insulation resistance up to 1000 megohms. On dead short, the meter deflects full scale, the internal resistors limiting the current to 100 microamperes. The circuit consists of a small Sola constant voltage transformer, a step-up transformer, and a rectifier-condenser network that delivers a steady filtered voltage of 1500 volts dc. It operates on 115 volts, ac.

Eastern Specialty Co., 3617 N. 8th St., Philadelphia 40, Pa.

Plastic Film (14)

A new plastic film for electrical insulating applications involving high temperatures, high frequencies and high voltages has been announced. "Scotch" brand PTF film is made from "Teflon". Two layers of 3-mil film, form a continuous surface insuring positive dielectric protection at a 5,000 volt level. Translucent film withstands temperatures from —100 to 500 degrees F. and meets both Class B and Class H requirements, permit-

3-speed *Milwaukee* ½" drill famous for more "MOTOR GUTS"

Powerful Milwaukee HOLE-SHOOTER combines straight and right-angle drilling . . . wonder-tool for close quarters

Built for use by electrical contractors and plant maintenance electricians, this Milwaukee ½" HOLE-SHOOTER — *America's first 3-speed Right-Angle Drill* — has demonstrated its unmatched time-saving performance on thousands of jobs. Most powerful drill built for its size and 9-lb. weight. Ball and roller-bearing equipped for extra-long service life.

You'll be amazed at its versatility — unit-built for quick change to suitable speeds for drilling in wood, metal, masonry, concrete, tile. Uses wood bits up to 3" . . . also ½" carbide-tipped drills.

For straight drilling, S-412 ½" HOLE-SHOOTER (above) has a chuck speed of 450 R.P.M. With the 2-speed "Right-Angle Drive" attachment, speeds are 300 R.P.M. or 675 R.P.M.

Head swivels full 360°. Locks in any position.
S-412 Drill with "2-speed Right-Angle Drive" $74.00

Other bits available also — We can supply you with any size wood-boring bits up to 3". Write us.

Complete S-412 Tri-Speed Kit Contains

1 — S-412 ½" HOLE-SHOOTER, Jacobs geared chuck.
2 — *Two-speed "Right-Angle Drive" attachment.
3 — 3 special bits — ¾", 1⅛", 2⅜".
4 — Special wrench.

*Pat. Pending

Complete S-412 KIT.. $88.75

Call your distributor today, or write us and give his name.

MILWAUKEE ELECTRIC TOOL CORP.

Makers of portable electric drills, saws, hammers, grinders, sanders, and accessories.

5352 W. STATE STREET • MILWAUKEE 8, WIS.

NOW!

Speeds all these jobs— and many more!

1. Attaching conduit and panel boxes to steel, concrete or brick.
2. Anchoring fluorescent and other lighting fixtures in concrete.
3. Radio and television fastening.
4. Fastening conduit clips to concrete or steel.
5. Fastening eye bolt in concrete for stringing wires.

REMINGTON STUDS FOR ANY JOB

Genuine Remington studs are designed for specific fastening jobs. They are made of special hardened steel alloys permitting pull-out resistance as high as 2 tons, depending on the stud used. These studs were developed by Remington after exhaustive testing for hardness, strength and profile.

Cartridges are available in 5 different power loads, each clearly marked by colored plastic heel caps. These tough heel caps permit instant assembly of any cartridge with any Remington stud. Easily removed from the stud after driving, the heel cap also protects the thread of the driven stud.

EXTERNAL THREAD

STANDARD HEAD

BREAK-OFF HEAD

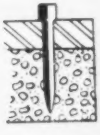
INTERNAL THREAD

Only Remington studs are identified by this target trademark on the head—it's your assurance of safe, dependable fastening.

It's fast, easy and safe to operate The Remington Stud Driver

Simply hand-assemble stud and power cartridge, load as a unit in easy-to-open Remington Stud Driver, and close.

Then press loaded Stud Driver firmly against surface, depress safety lever, and pull trigger.



Explosive charge imbeds stud solidly. Open Stud Driver with a twist of the wrist, eject empty shell, load next stud. Whole job takes seconds!

Do your construction fastening up to 100 times faster with the

NEW CARTRIDGE-POWERED MODEL 450

REMINGTON STUD DRIVER

and do it safely!

LOOK AT ALL THESE FEATURES

COMPACT AND PORTABLE—Weighs only 5½ pounds, ideal for scaffold, ladder, overhead work, inaccessible places. Comfortable to use in any position.

SPEED—One man can set up to 5 studs per minute, as much as 100 times faster than other methods. Sets stud at whatever depth is required up to 2¾ inches, depending on material.

ELIMINATES INVESTMENT in outside power source—Self-powered. Especially useful in isolated places.

FOUR WAYS SAFE—Plainly visible red dot indicator shows when it's cocked; safety lever must be depressed before and during squeezing of main trigger; permanently attached safety shield must be compressed against work before Stud Driver will operate. Stud Driver will not operate if tilted at more than a slight angle. Slight recoil. Low noise level.

RUGGED—All working parts of the Stud Driver are made of heat-treated alloy steels, housing of strong, light weight aluminum that carries no operating stress. Lining of safety shield is a solid block of tough, resilient Du Pont neoprene.

PRICE for Model 450 Remington Stud Driver complete in rugged steel carrying case—only $119.50.

Firmly fastens steel or wood to concrete or steel *in seconds!*

With the amazing new Remington Stud Driver you can set fastening studs up to 100 times faster than with conventional methods . . . and cut costs, too. This revolutionary fastening tool easily sets as high as 5 studs per minute . . . with no outside power source—no other equipment needed!

Easy to operate, the Remington Stud Driver weighs only 5½ pounds. It's compact, rugged and safe! With one lightning-fast operation, this self-powered tool firmly fastens steel or wood structural pieces and fittings to concrete or steel surfaces . . . a squeeze of the trigger and the job is done!

Test-proved to be the world's finest and speediest fastening system, the Model 450 Remington Stud Driver is made by Remington Arms Company, Inc., *America's oldest and foremost sporting arms manufacturer.* To obtain detailed information on this time- and money-saving tool, and for the name of your nearest distributor, fill out and mail the coupon below.

"If It's Remington—It's Right!"

Remington

DU PONT

Remington Arms Company, Inc.
Industrial Sales Division Dept. EC4
939 Barnum Ave., Bridgeport 2, Connecticut

I am interested in obtaining descriptive literature on the Model 450 Remington Stud Driver.

*Name*_____

*Firm*_____

*Position*_____

*Address*_____

*City*_____ *State*_____

MARTINDALE GROWLERS

PORTABLE GROWLER TYPE U-2

This Universal Adjustable Growler may be used as both an external Growler for armatures and an internal Growler for stators. It will test armatures from 2" diameter up, and stators from 5¾" diameter up.

ADJUSTABLE BENCH GROWLER

Has adjustable jaws with face length of 2½". With jaws closed will test armatures as small as 1" diameter. With jaws open, will accommodate armatures as large as 18" diameter.

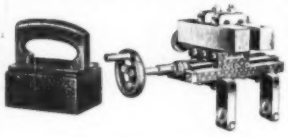
Both types available with or without meters. Also six other models.

MARTINDALE WHEEL AND GEAR PULLER

Adjustable arms pull straight without squeezing the work. Set screws prevent spreading.

Made in 2 Styles and 4 Sizes up to 24" diameter.

MARTINDALE COMMSTONES AND COMMUTATOR GRINDING TOOLS



MICA UNDERCUTTERS FOR SLOTTING COMMUTATORS

Nine Motor Driven Types

Write for 64-page Catalog describing these and many other products for industrial Maintenance, Safety and Production.

MARTINDALE ELECTRIC CO.

1309 Hird Ave. Cleveland 7, Ohio

ting its use in construction of Class H capacitors. It is non-flammable, will not rack; resists all solvents with the exception of certain boiling chlorinated solutions; is unaffected by all types of impregnating varnishes, and will not absorb moisture. Film is used as insulation in construction of electric motors, generators and transformers, and for high voltage conductors and cables such as hook-up wires for electronic appliances, ignition cables and transformer lead wires. Film is available in 36-yard rolls in widths from ¼-inch to 6 inches.

Minnesota Mining and Manufacturing Co., 900 Fauquier St., St. Paul 6, Minn.

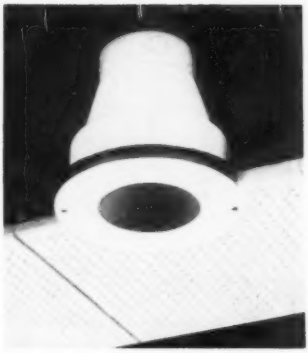
Attic Fan (15)

A new attic fan for home ventilation and cooling has been announced. This vertical discharge unit measures around three feet square and projects 17½ inches above the attic floor. It is for use over narrow hallways and in low attics. Installations can also be made over the kitchen or other rooms, depending on construction. Fan units rest on attic floor. Rubber bases provide an air seal and cushion between fan frame and attic floor. Ceiling shutter opens and closes automatically as fan is turned on or off. This shutter is installed by attaching to wood frame of ceiling opening. Available in 4750 and 6800 CFM capacities.

Robbins & Myers, Inc., 387 S. Front St., Memphis, Tenn.

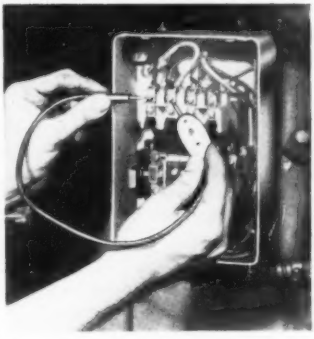
Lighting Fixture (16)

A new recessed downlight for pinpoint lighting through a controlled beam of light has been announced. Named Silver-dot, the unit is designed for glare-free accent or special effect lighting in commercial and residential interiors. It makes use of the new



100-watt A-21 clear silvered-bowl lamp. Unit requires a ceiling opening of 6½-in. diameter and a recess depth of 7¼ inches. It provides a 6-foot diameter circle of light at a vertical distance of 6 feet from surface being lighted. It can be relamped without removing ceiling plate. Commercial applications cover a wide variety of high-level accent lighting uses in stores, specialty shops, restaurants and clubs. For residential use, suggested applications include installation over dining room tables, work counters, in halls and recreation game rooms.

Silvray Lighting, Inc., 100 West Main St., Bound Brook, N. J.

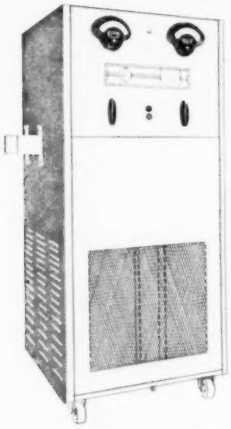


Circuit Tester (17)

A new pocket-size circuit tester for the serviceman has been introduced. It is designed to test for shorts and grounds on appliances or lines from 90 to 550 volts ac-dc, and is called "Dandy-Lite". Operating on the neon glow lamp principle, tester is complete with two test prods connected to the lamp in series. It will test for grounded lines or line polarity, and can be used to check automotive cables. In addition, electric fences, radios and television sets can be checked.

Neo-Lite Manufacturing Co., 915 Taylor Ave., Rockford, Ill.

SET IT AND FORGET IT



RICHARDSON-ALLEN
DEPENDABLE
SELENIUM RECTIFIERS

FUNCTION PERFECTLY WITH ABSOLUTELY MINIMUM MAINTENANCE

Aside from a cooling fan which requires occasional oiling, there are no moving parts in a Richardson-Allen Selenium Rectifier — *no brushes to replace — no expendable parts — no trouble.* INSTALL IT AND FORGET IT.

Where DC is needed to operate elevators and escalators in public buildings; cranes, magnetic chucks and special machinery in factories; hospital and laboratory equipment; high intensity arc lights in arenas and theaters, a power breakdown is always expensive—frequently dangerous! Guard against this. Install Richardson-Allen Selenium Rectifiers.

Richardson-Allen engineers have developed voltage and current controls within ±2% over wide load ranges. Richardson-Allen Selenium Rectifiers are made from 1 kw up to 150 kw in a single cabinet.

A Richardson-Allen Selenium Rectifier is easy and inexpensive to install. Merely set it in place, connect it to the AC power main, provide access to free air, and you're in business. Our convection-cooled units require a minimum of maintenance. No tubes, no liquids, no trouble!

Richardson-Allen Dependable Selenium Rectifiers may be paralleled to obtain any kilowatt requirement. As load requirements increase, install additional Richardson-Allen rectifiers.

Ask for data sheets on Richardson-Allen Selenium Rectifiers. At the same time, please describe your DC requirements.

RICHARDSON-ALLEN CORPORATION
a manufacturing affiliate of
WESLEY BLOCK AND COMPANY
39-15 MAIN STREET, FLUSHING, NEW YORK
IN CANADA: Richardson-Allen of Canada, Ltd., 370 Victoria St., Toronto, Ontario

DEPENDABLE POWER FOR EVERY DC NEED

You Can Spot FIRE

BEFORE IT REALLY GETS STARTED with NEW ELECTRONIC DETECTOR!

SURE, SAFE LOW-COST PROTECTION 24 HOURS DAILY

You can spot fires without delay with the American Electronic Sentry providing automatic fire detection. The first wisp of smoke across the light beam flashes the alarm . . . warns of fire before the sprinkler heads go into action. This new alarm system virtually ends the danger of destructive fires in warehouses, hospitals, schools and factories.

AUTOMATIC IN USE . . . EASY TO INSTALL

The American Electronic Sentry System "watches" an area about 150 ft. x 30 ft. with each pair of Light-Beam Projector and photo-electric Sensor. Additional pairs cover larger areas.

Smoke is "reported" to an Annunciator Panel which may be located nearby, or up to 2 miles away, connected by inexpensive wiring. The signalling device may be horn, bell, siren or light located where most useful. Current consumption is low, about 50 watts a unit.

NO "ACCIDENTAL" FAILURES

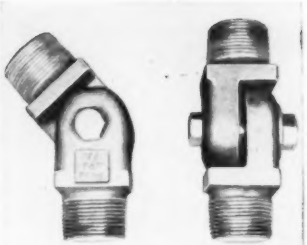
The Projector has a built-in supervisory circuit to warn of failures. Automatic voltage regulation. Any power interruption sets off alarm.

Approved By Factory Mutual Laboratories

WRITE FOR FULL DETAILS Full information on The American Electronic Sentry may be obtained promptly and without obligation by writing to . . .

FM

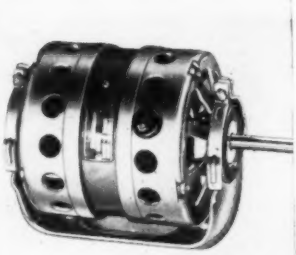
ELECTRONICS DIVISION
AMERICAN ENCAUSTIC TILING CO., INC.
901 Kenilworth Ave., Lansdale, Pennsylvania



Adjustable Angle Fitting (18)

A new adjustable angle fitting which permits vertical suspension of overhead type electrical equipment from sloping or arched roof members has been announced. Unit features 90° adjustment and also permits angle mountings from wall posts or columns. Originally developed for use with Thompson disconnecting-lowering lighting fixture hangers, it can be used to suspend other types of lighting units, loud speakers, unit heaters, overhead fans, blowers, motor platforms, and other electrical equipment weighing up to 1500 pounds. When utilized with floodlights, this fitting facilitates perfect balancing in any vertical or radial position so that lights can be focused independently. Available in three types.

Thompson Electric Co., 1111-57 *Power Ave., Cleveland* 14, *Ohio.*



Motor (19)

A new Cyclohm induction motor, Model 3700, rated 1/25 to ¼ hp, featuring a new resilient mounting base, has been announced. Available in the 3700 motor series are several models, the Hysteresis synchronous and normal induction types in two pole versions, both simple phase and polyphase. Model 3700 will be available in the near future in 2, 4, 6 and 8 pole models including reluctance synchronous and torque motor types.

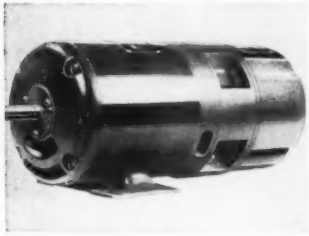
Howard Industries, Inc., Racine, Wis.

Insulating Varnish (20)

A new all-purpose electric insulating varnish, 9700, has been developed for use on a wide variety of electric equipment. It is suitable for treating motor and generator cores and windings, magnet coils, and transformer windings. It can be used on rotors with speeds up to 10,000 r.p.m. An oil-modified phenolic varnish, it cures thoroughly in deep sections giving high bonding strength with a smooth, wrinkle- and bubble-free surface. It may be applied by dipping, roller coating, brushing or spraying, and vacuum or pressure impregnation may be employed. Containing 49-51% solids, it can be thinned with petroleum spirits.

General Electric Company, Pittsfield, Mass.

(21)



A ¼ HP MOTOR on the 56 frame series with integrally mounted Stearns magnetic brake has been announced. Similar designs are available on motors up to and including the NEMA 254 frame. Both open and enclosed motors can be furnished for either single or three phase service. A new line of right angle, fractional hp gear motors is also available with motor mounted brakes. Manufactured by Doerr Electric Corp., Cedarburg, Wis.

Matching Knockouts (22)

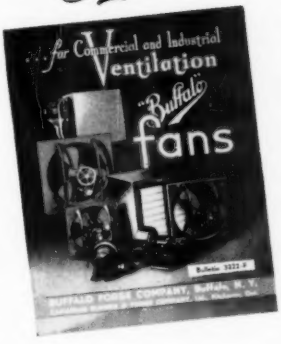
A new type of matching knockout to eliminate time-consuming conduit bending when ganging electrical devices has been announced. Tangent knockouts provide ½-¾ inch concentric knockouts with larger knockouts in a tangent pattern. The common center of the two smaller knockouts is a constant distance from the rear of the enclosure. This positions the tangent pattern, insuring matching knockouts regardless of size of cluster or device rating. This feature is now furnished on safety switches, circuit breakers, starters, contactors, auxiliary wiring gutters and fusible entrance equipment.

Square D Company, 6060 Rivard St., Detroit 11, Mich.

EASILY INSTALLED PROPELLER FAN FOR YOUR PRESSURE* JOBS

*For as high as ¼" static pressure

"Buffalo" HEAVY DUTY BREEZO



Here's a heavy-duty fan you can install easily! Die-stamped of heavy-gauge metal, it is rigid and strong. Its square flanged panel with pressed knockouts means quick installations. Note the rugged die-stamped blades, motor bracket and arms. Here's a fan you can sell in confidence that it will give absolute satisfaction. Type "NV" Breezo Fans are available in 7 sizes, 12" to 36" for as high as 15,000 c.f.m. delivery.

WRITE FOR BULLETIN

3222-F for all details on "Buffalo" Heavy-Duty Breezos, as well as some of the other "Buffalo" Fans that are favorites with users and contractors everywhere.

First For Fans

BUFFALO FORGE COMPANY

520 BROADWAY BUFFALO, NEW YORK

PUBLISHERS OF "FAN ENGINEERING" HANDBOOK

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

Sales Representatives in all Principal Cities

PANEL BREEZO FANS BELTED VENT SETS BELT-AIR FANS

BREEZ-AIR ATTIC FANS "L" BREEZO FANS "NV" BREEZO FANS

A Twist of the Wrist and IT'S LOCKED!

NEW Turn-Tyte INTERLOCKING DEVICES by RODALE

Got a wire connection problem on industrial equipment? New TURN-TYTE *Cord Connectors, Caps and Receptacles* are your answer!

YOU SAVE TIME!

Slight turn locks them TIGHT!

TURN-TYTE *2-Wire Armored Cord Connector Body*. Two pieces of molded bakelite, with armored base and cord clamp. Bronze contacts coated to resist rust and corrosion. Available in 10-15 amps. (# 2100) and 20 amps (# 2200).

YOU SAVE MONEY!

...they're fully INTERCHANGEABLE with other makes!

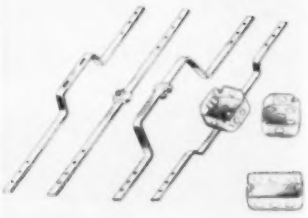
TURN-TYTE *2 Wire Armored Cap* with cord clamp. Bakelite with brass blades. Available in 10-15 amps (# 1206) and 20 amps (# 1226).

SOLD ONLY THROUGH LEADING WHOLESALERS

If your wholesalers cannot furnish you with TURN-TYTE devices, we will be pleased to send a new catalog and names of suppliers in your area who can fill all your RODALE needs.

Also Available: **3-Wire, Polarized and Grounded. 10-15 Amps and 20 Amps. IMMEDIATE DELIVERY!**

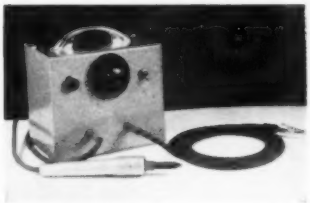
RODALE MANUFACTURING CO., INC.
EMMAUS PENNSYLVANIA



Bar Hangers (23)

Four types of bar hangers are available. They are brake-formed from $\frac{3}{16}$-in. by $\frac{1}{2}$-in. band steel, with rounded mill edges. Sliding studs are easy working and double-strength for durability. Hangers are U.L. approved and available in straight, shallow, deep or universal offset types as separate units or in combination outlet box and bar hanger assemblies. Standard lengths include 10½-in., 21-in. and 24-in.

Keystone Manufacturing Co., 23328 Sherwood Ave., Center Line, Mich.



Soldering Unit (24)

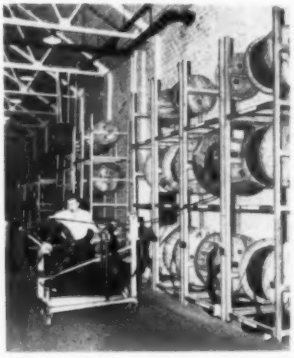
A new type of resistance soldering unit has been announced. Known as Glo-Point soldering unit Model K-72, it features an adjustable heat control which allows the electrodes to heat up to 1500° F instantly. It is useful for soldering connections of electronic tubes, radio and television parts, radar equipment, jewelry, silver, thermal connections, etc. Power unit is enclosed in a 4-in. by 5-in. by 6-in. ripple-finished case. Electrode handle is 7 inches long, weighs 2 oz. and is of heat resistant plastic.

Sunrise Products Company, Hawthorne, N. J.

Tape (25)

A new oil-resistant tape for insulation build-up on splices in large power cables has been announced. Designated "Scotch" brand electrical tape No. 25, it is made of synthetic rubber providing dielectric strength and resistance to high temperatures. Chemical-resistant qualities of tape make it especially suitable for use in oil drilling, mining and underground cable operations. Dielectric strength is 15,000 volts unstretched, and 10,000 volts at 500% elongation. It has an electrolytic corrosion factor of 1.0 and an insulation resistance of 100,000 megohms. Tape is available in ½-inch by 15-foot rolls, is green-colored, and has a white strippable liner to be removed before use. Tape is not designed as a sole insulation. "Scotch" plastic electrical tape No. 33 is recommended as outer wrap for protection against moisture, weather, and abrasion.

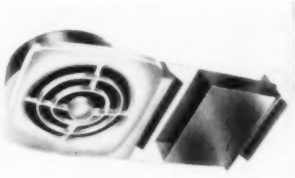
Minnesota Mining and Manufacturing Co., 900 Fauquier St., St. Paul 6, Minn.



Reel Rack (26)

Storage space is conserved, and handling of reels of cable, loom, wire, tubing, rope, beading, extruded plastic shapes, etc., is made more efficient by a new type stacking rack. Reel is placed in rack at floor level, "U's" provided on cross members locate reel axle. Reel and rack is then handled as a unit by lift truck. Racks are of welded square tube construction with self-aligning nesting feet.

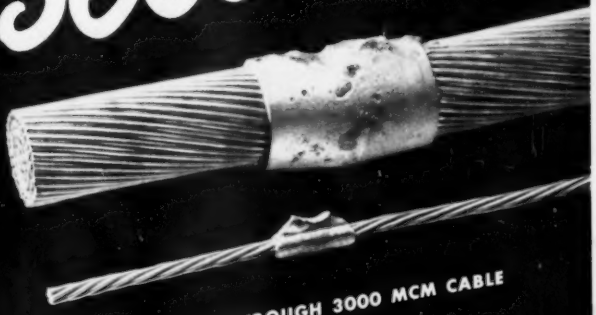
Equipment Manufacturing, Inc., 21550 Hoover Road, Detroit 5, Mich.



Kitchen Fan (27)

The Air King line of built-in kitchen fans has been redesigned. One model is for ceiling or side-wall mounting. It measures 3½ inches deep, overall,

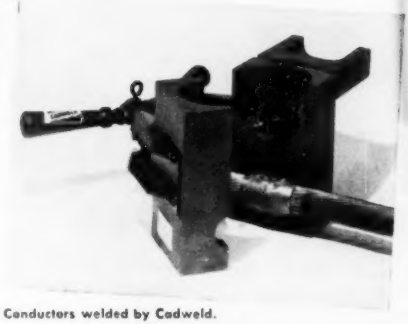
WELDED IN 10 seconds BY CADWELD*



#6 WIRE THROUGH 3000 MCM CABLE

Conductors placed in Graphite Mold.

Cartridge dumped in crucible and ignited with a flint gun.



Conductors welded by Cadweld.

*THE CADWELD PROCESS

A controlled reduction of copper oxide with aluminum producing molten copper at approximate 4000° F.

A CADWELD CONNECTION

- Cannot loosen or corrode.
- Cannot be damaged by excessive overload.
- Has current carrying capacity equal to that of original conductor.

Light weight portable equipment—ideal for field work.

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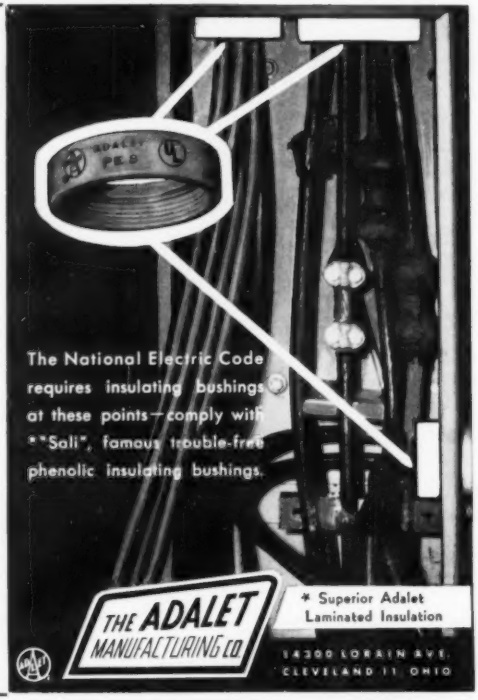
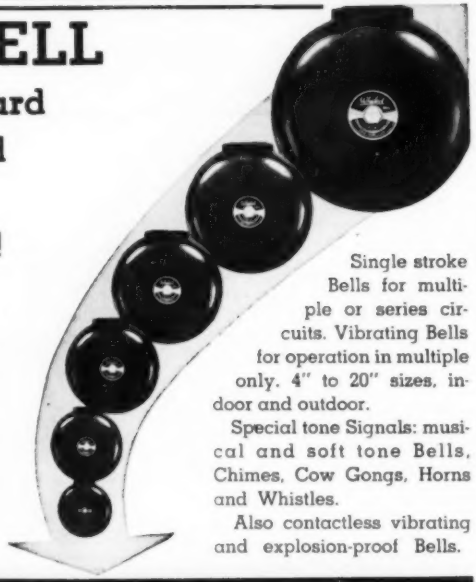

The National Electric Code requires insulating bushings at these points—comply with **Soli", famous trouble-free phenolic insulating bushings.
THE ADALET MANUFACTURING CO.
* Superior Adalet Laminated Insulation
14300 LORAIN AVE.
CLEVELAND 11, OHIO

The BELL that's heard around the world!



SMALLER SIZE BELLS AVAILABLE ON SPECIAL ORDER

WRITE FOR 32 PAGE CATALOG 5-3

Single stroke Bells for multiple or series circuits. Vibrating Bells for operation in multiple only. 4" to 20" sizes, indoor and outdoor.

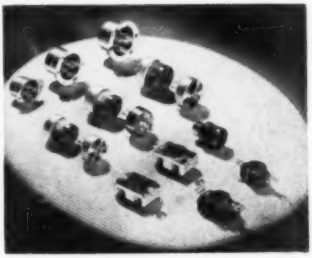
Special tone Signals: musical and soft tone Bells, Chimes, Cow Gongs, Horns and Whistles.

Also contactless vibrating and explosion-proof Bells.

Wheelock SIGNALS
SIGNAL ENGINEERING & MFG. CO.
154 WEST 14TH ST. NEW YORK 11 N.Y.

and has an adjustable frame which fits between 16 inch studs or center joists for installation anywhere in the kitchen. Unit also incorporates a blower-type blade which maintains high air exhaust volume in long ducts. The chrome or white enamel grill can be removed by unscrewing a center knob. Fully automatic and pull chain kitchen fans also have same grill and construction features as ceiling model. The automatic fan is wall switch controlled. Motor in both models is mounted on one bracket with motor and blade removable. Fan sizes are 8 and 10 inches.

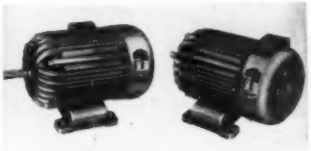
Berns Mfg. Corp., 3050 N. Rockwell St., Chicago 18, Ill.



Wiring Devices **(28)**

A new line of wiring devices called "Hart-Lock" has been announced. Hart-Lock is a current carrying device that locks in position and prevents accidental disconnects. It is installed in the same way as ordinary connecting devices but assures a positive lock by a twist of the cap in the connector body or receptacle. To disconnect, a reverse twist unlocks it. The line includes an assortment of 20 amp, 2-wire, 3-wire and 4-wire connector bodies; motor plugs; flush receptacles; and regular rubber and armored caps with or without cord grips.

Arrow-Hart & Hegeman Electric Co., Hartford, Conn.

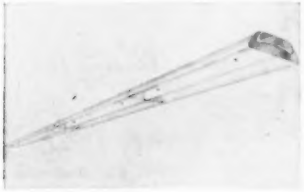


Motors **(29)**

A new series of totally enclosed and totally enclosed fan-cooled motors, ranging from ¼ through 3 hp, has been introduced. Smaller ratings are totally enclosed. Intermediate ratings built in field-ring construction are totally enclosed, fan cooled. Larger ratings

are also totally enclosed, fan-cooled, but in addition, they are provided with external fins for greater heat dissipation. All blind passages that might accumulate dirt have been eliminated on both fan-cooled models. Motors are intended for heavy duty use on any general purpose application where dust, dirt, wood chips, metal shavings and the like are encountered. Windings are insulated with heavy formvar and braced with baked varnish. Stator slots are lined with cellulose acetate paper.

Kingston-Conley Division, The Hoover Company, 68 Brook Ave., North Plainfield, N. J.



Lighting Unit (30)

A new A.L.S. industrial slimline fixture has been announced. 22.5% uplighting is a feature of unit. Glare caused by sharp contrast between bright areas below lamps and dark areas in cavity above lamps is reduced by uplighting. 30° shielding is provided. Maximum airflow through the fixture minimizes turbulence and permits circulation of air. Reflectors shield lamps. Available in 4-, 6- and 8-ft. lengths. Baffles are available to give additional lengthwise shielding.

Smithcraft Lighting Division, Chelsea 50, Mass.

Product Briefs

(31) Titeflex, Inc., Newark, N. J., has announced the marketing of a complete line of new electrical **connectors**, originally developed by the Salsbury Corp., Los Angeles, Calif. . . . (32) Trombetta Solenoid Corp., 329 N. Milwaukee St., Milwaukee, Wis., has developed a new solenoid operated **shoe brake**. . . . (33) Erico Products, Inc., 2070 East 61st Place, Cleveland 3, Ohio, has developed the Caddy Type B 500 amp **electrode holder**.

(34) Utica Drop Forge & Tool Corp., Utica 4, N. Y., has developed a new 4½-in. **plier-snip** No. 101. . . . (35) A new watchmaster automatic **standby light** with glass jar rechargeable battery and visible ball float hydrometer is available from Carpenter Mfg. Co., Boston 45, Mass.

Unsurpassed for Quality

with dependable service
design and workmanship
choice of materials
underwriters' acceptance

*For over 45 years, McGill has produced superior electrical units of sound design and mechanical excellence, that have been universally accepted by industry, commerce and in the home. Users frequently report Levolier switch installations operating as usual after many times the years of service expected of an ordinary switch with equal capacity. Specify Levolier switches—it always pays to use the best.

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McGill Levolier No. 41 switch is Unconditionally Guaranteed. Made now with one piece molded phenolic casing — easier to wire and install. Provides most dependable control of lighting circuits with longest service possible in a 6 amp. "T" rated 125 volt switch. Write for catalog No. 49.

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MEANS SMOOTHER OPERATION
LONGER WEAR
Exploded View of Joint
#259P
UTICA
UTICA Lubring®-the pliers that oil themselves! Porous iron lubricating ring "floats" in the joint, absorbs lubricant and feeds it as required. Keeps joint smooth and free-working. There are no finer lineman's pliers than these patented and exclusive UTICA heavy duty Lubrings.
#259P 6",7",8". Also with splicing grooves, #259S
SPECIAL HANDLES
Utica lineman's pliers can be supplied with heavy, black rubber vulcanized handles. Designed for comfortable grip, long wear and protection.
Send for booklet describing Utica's complete line of Lubring Pliers.
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and the world's best tools are made in U.S.A.
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BLACKBURN
Hi-Strength
SPLICE CONNECTOR
Only 4 Sizes COVER WIRE RANGE
Made for #4 to 1000 MCM—in only 4 sizes! Ideal for end-to-end connections because they are so easy to install, and make a neat, compact, easy-to-tape joint.
Note the inspection holes on top and sides, enabling the wireman to know that the cables are properly inserted and gripped in place. Order by ampere rating: S100, S225, S400 or S650.
JASPER BLACKBURN CORPORATION
35 Madison St. • St. Louis 6, Mo. • Phone CEntral 3007

(36) A new hand **pyrometer** with two scale ranges for the measurement of surface, liquid, gas and molten-metal temperatures has been announced by General Electric Company, Schenectady 5, N. Y. . . . (37) The Baldor Electric Company, 4353 Duncan Avenue, St. Louis 10, Mo., has developed a 24-in. and 30-in. **air circulator** with adjustable floor column.

(38) RCA Tube Department, Camden, N. J., has announced a new 7-inch, direct-view **kinescope** designed for monitor service in conjunction with industrial television. . . . (39) A new steel **measuring tape** called "Boss Wyteface", has been introduced by Keuffel & Esser Co., Hoboken, N. J. . . . (40) Hunter Fan and Ventilating Co., 400 S. Front St., Memphis 2, Tenn., has introduced new window fans for apartment or small home use. Sizes are 18-in. and 22-in.

(41) A new Universal **motor,** EMC Model 1120, rated 1/40 to 1/12 hp, has been announced by Howard Industries, Inc., Racine, Wis. . . . (42) Emerson Electric Mfg. Co., St. Louis 21, Mo., has introduced 20-inch, 24-inch and 30-inch electrically reversible window **fans.** . . . (43) General Control Company, Boston 34, Mass., has developed a new, miniature, telephone-type lever **switch.**

(44) New open-blade, snap-acting **switch** has been announced by the Unimax Switch Division, W. L. Maxson Corp., 460 West 34th Street, New York 1, N. Y. . . . (45) A new smudge-proof pressure-sensitive **labeling tape,** for all industrial labeling and identifying jobs, has been announced by the TapeMark Co., 321 Cedar St., St. Paul, Minn. . . . (46) Zenith Manufacturing and Chemical Corporation, 52 Beekman St., New York 38, N. Y., has introduced a new **type of cleaning machine** for all industrial uses.

(47) Big beam-sealed beam, portable **electric hand lamp** has been announced by U-C Light Mfg. Co., 1050 West Hubbard St., Chicago 22, Illinois. (48) Ranetite Manufacturing Co., Inc., St. Louis, Mo., has developed a new silicone base **water repellent** for surface application to exterior, above grade masonry. . . . (49) An electronic pilot **relay,** capable of controlling large values of current and power has been announced by Haledy Electronics Co., 57 William Street, New York, N. Y.

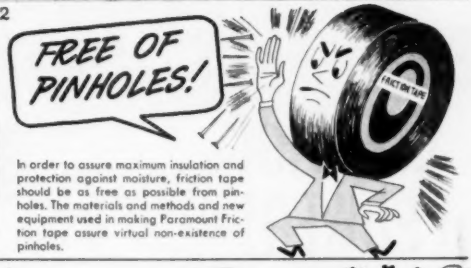
(50) The Instrument Division, Allen B. DuMont Laboratories, Inc., 1500 Main Ave., Clifton, N. J., has announced a new dual-beam **oscillograph,** engineered specifically for general-purpose laboratory and industrial applications. . . . (51) Pryne and Company, Pomona, Calif., has introduced a new infra-red, recessed electric **wall heater.** . . . (52) A new "quick-hot" transformer type **soldering gun** has been announced by Wen Products, Inc., 5806 Northwest Highway, Chicago 31, Ill.

PARAMOUNT FRICTION TAPE by Haartz-Mason

1

Made under the most exacting requirements in the industry, Paramount Friction tape can be tightly wrapped — yet can be torn readily as required. A margin of safety in this respect is added to every roll of Paramount Friction tape.

2



In order to assure maximum insulation and protection against moisture, friction tape should be as free as possible from pinholes. The materials and methods and new equipment used in making Paramount Friction tape assure virtual non-existence of pinholes.

3

Automatically cut with smooth, neat edges on Cameron cutting machines. These machines wind it on the cores under tension. This is your insurance against ravelling.

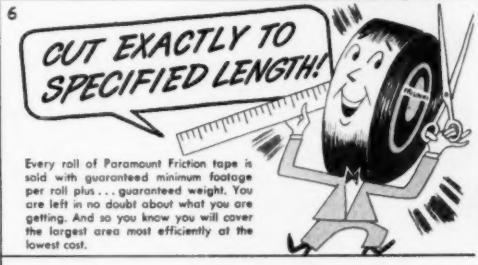
4

Under controlled temperature and humidity, Paramount Friction tape is strictly tested for permanence of adhesion.

5

Taken from stock at regular intervals, sample rolls of Paramount Friction tape undergo accelerated aging tests in an electric oven at 212° F. for 16 hours. Thus you get a guarantee of maximum aging ability.

6



Every roll of Paramount Friction tape is sold with guaranteed minimum footage per roll plus . . . guaranteed weight. You are left in no doubt about what you are getting. And so you know you will cover the largest area most efficiently at the lowest cost.

7

To sum up, Paramount Friction tape, besides being made of finest materials, also undergoes rigorous pre-testing at the factory. Among the rigidly conducted tests are those for aging, adhesion and strength.

Dual Guarantee on Weight and Length

Manufactured by

Haartz-Mason, Inc.

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Catalogs, Bulletins and Engineering Data

(53) ELECTRICAL CONNECTORS, waterproof, weatherproof, acidproof, vibration resistant, are described in illustrated booklet, including complete specifications, construction and application data and connector numbering system and wiring information. Titeflex, Inc., 500 Frelinghuysen Ave., Newark 5, N. J.

(54) CLOCK HANGER RECEPTACLE is the subject of data sheet illustrating and describing the construction and application of the receptacle which has a recessed face to accommodate a clock plug and has a hook at the top to support any normal size clock. National Tool and Manufacturing Co., 100-120 N. 12th St., Kenilworth, N. J.

(55) TUBULAR RHEOSTATS, potentiometers, and resistors from 220 to 1000 watts are illustrated and described in 16-page booklet covering construction, operation, application and control characteristics of these units, plus new fine adjustment type rheostat, tubular rotary drive rheostats, graded and taper wound, non-inductive and miniature slide wire rheostats. Rex Rheostat Company, 3 Foxhurst Rd., P. O. Box 232, Baldwin, L. I., N. Y.

(56) NYLON-LINED BEARINGS for rotation and reciprocation are illustrated and described in 4-page bulletin, including advantages as a bearing material, operating principles, design, application and types, sizes and costs. Thomson Industries, Inc., Manhasset, N. Y.

(57) CABLE PULLING COMPOUND and wire pulling compound are described in bulletin covering the characteristics of the compound, its application and description of other electrical compounds. Adam Cook's Sons, Inc., Linden, N. J.

(58) ANNIVERSARY BOOKLET contains 19 pages of information on the development of pipe threading tools and power pipe machines, a listing of the complete line of pipe tools, illustrations of the manufacturing of pipe tools and many actual job applications of pipe tools. Toledo Pipe Threading Machine Co., Toledo, Ohio.

(59) SAFETY MANUAL is a 71-page publication covering "Safety Interpretations of J. I. C. Electrical Standards for Machine Tools and Other Industrial Equipment", including 23 illustrations of good and bad examples of electrical design and practice. General Motors Corp., General Motors Bldg., Detroit 2, Mich.

(60) MINIATURE LAMP CATALOG contains 36-pages, listing and illustrating hundreds of types of miniature lamps and their applications, including information on size, life, voltage and cost of each lamp, and on low voltage sources of power. General Electric Co., Nela Park, Cleveland 12, Ohio.

(61) MOTOR BOOKLET B-4731 illustrates and describes the design and application features of Life-Line motors, in ratings up to 700 hp, with special sections covering the construction of motor frames, end brackets, stators, rotors, bearings and standard and special mountings and enclosures. Westinghouse Electric Corp., Box 2099, Pittsburgh 30, Pa.

(62) INDUSTRIAL EQUIPMENT is the subject of 28-page booklet illustrating and describing metal detectors, induction and dielectric heating, inspection machinery, industrial television, two-way radio, sound systems, tubes, batteries and test equipment. Industrial Equipment Section, Engineering Products Dept., RCA, Camden 2, N. J.

(63) RESISTOR CATALOG describes and illustrates power rheostats, fixed resistors and adjustable resistors, including complete technical and engineering data on construction, characteristics, resistor mounting diagrams and terminal types. Tru-Ohm Products Div., Model Engineering & Mfg. Inc., 2800 N. Milwaukee Ave., Chicago.

(64) TEST EQUIPMENT is illustrated and described in 8-page bulletin, including electrical insulation resistance tester, hypotential dielectric strength tester, instrument current transformers, ohmmeters, volt-ammeters and other special purpose instruments. Associated Research, Inc., 3752 West Belmont Ave., Chicago 18, Ill.

(65) DATA SHEETS on Class H electrical insulation, and components made with silicones, illustrate and describe improvements in the design and performance of electrical equipment using silicone insulation and cover specifications on silicone-varnished glass cloth and tape. Dow Corning Corp., Midland, Mich.

(66) MERCURY PLUNGER RELAYS for street lighting purposes are illustrated and described in bulletin, including specifications on the standard 30 ampere relay, mounted in weatherproof housing, with or without fused coil circuits, fused load circuits and lightning arrestors. H-B Instrument Co., 2633 Trenton Ave., Philadelphia 25, Pa.

(67) BATTERY CHARGERS, type S single circuit motor-generator units for industrial batteries, are illustrated and described in bulletin 10-210, including construction and operation data and complete electrical specifications. The Electric Products Co., 1725 Clarkstone Rd., Cleveland 12, Ohio.

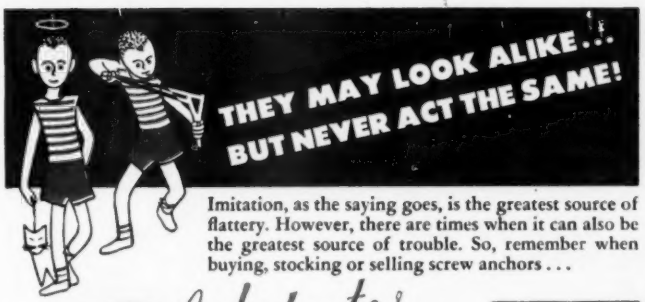
(68) DATA SHEETS on commercial fluorescent lighting fixtures and equipment contain description and illustrations of the units, construction details, candlepower distribution curves, coefficients of utilization and installation details. Silvray Lighting Inc., 100 W. Main St., Bound Brook, N. J.

(69) ELECTRICAL INSULATION, papers, pressboards and fibre, are described with illustration data in 12-page catalog covering the advantages, properties and applications of all and part rag pressboards and papers, wood pulp and rope papers. Insulation Manufacturers Corp., 565 West Washington Blvd., Chicago 6, Ill.

(70) TEST PROCEDURES and practices for dc insulation testing on high voltage electrical apparatus are discussed in articles covering planned maintenance of equipment by dc testing and elimination of major breakdowns of high speed rotating machinery, cables, transformers, circuit breakers, motors, etc. The John Hewson Co., 106 Water St., New York 5, N. Y.

• • • •

A new, 330-page, revised edition of the architect and engineers electrical data book, containing comprehensive illustrated technical data on electrical power, distribution and utilization equipment, their selection and application, may now be obtained from the nearest Westinghouse District Office, Westinghouse Electric Corporation.



Imitation, as the saying goes, is the greatest source of flattery. However, there are times when it can also be the greatest source of trouble. So, remember when buying, stocking or selling screw anchors . . .

Substitutes

CAN PROVE DANGEROUS!

The word "Rawlplug" used in connection with *Jute Fibre Screw Anchors* is exclusively the property of The Rawlplug Company, Inc. For forty years it has been secured to them by common law and by trademark registry. It is the corporate and trade name of the company and specific product of their manufacture.

BE SECURE BY BEING SURE

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RAWLPLUGS *on the* Blue Box

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RAWLPLUGS because of their chemically treated braided jute fibre construction . . . Hold Better . . . Last Longer . . . Weigh Less and Hold More! They . . . Eliminate extra troublesome spotting and layout work. Rawlplugs are the only universal anchors which can be used in any material.

"IF YOU DON'T USE RAWLPLUGS . . . THERE'S A SCREW LOOSE SOMEWHERE"

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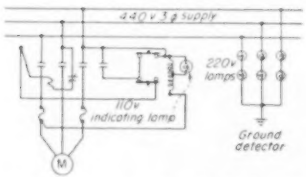
QUESTIONS from readers on problems of industrial equipment, installation, maintenance and repair. Answered by electrical maintenance engineers and industrial electrical contractors out of their experience. For every question and every answer published we pay $5.00.

Reader's Quiz

Wiring Pushbutton Stations

QUESTION E20—*There is an argument as to the proper method of wiring pushbutton stations equipped with indicating lights and I would appreciate any information on the matter. A few of the boys contend that the autotransformer should be energized only from the load side of the linestarter. Our practice so far has been to use a jumper from the line side of the normally open contact as shown on the accompanying diagram. This method*



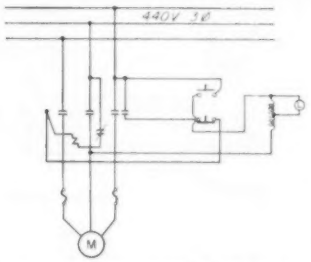
requires the use of only four wires whereas the former method requires the use of five wires thereby adding to the cost of installation. Are there any objections to either method?

We also have several units of ground detectors in our plant, some units utilizing voltmeters and others using lamps. When the indicating lights are wired as shown and the insulation resistance of the motor in the circuit falls below 30,000 ohms, the indicating lamps will glow although the linestarter is open. The transformer circuit is being completed through the ground detector lamps. However, there is no noticeable difference in the ungrounded phase, as is the case when there is a low resistance in the motor windings where no indicating type pushbuttons are used.—H.L.S.

ANSWER TO E20—The sketch above indicates one method of wiring the indicating light so that the circuit is completely off when the linestarter is open, and yet only uses four wires.

It is assumed that the indicating light is one or two watts only so that its current may be safely broken by the auxiliary contact.

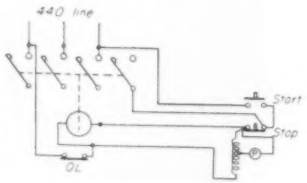
There is certainly an objection to having one side of the light permanently connected to the live side and that is the danger whenever a lamp is changed.



I am not sure regarding the action mentioned on the ground detectors, but the explanation may be that the indicating light takes only 0.002 amps against possibly 0.06 amps through the ground detector lamps. Sufficient current to light the indicator light would hardly affect the ground detector lamps, i.e., the indicator light will show a high resistance ground that would not affect the ground detectors. —J.P.T.

ANSWER TO E20—By using a circuit for pushbutton control of a magnetic starter as shown, the motor winding will not be completely disconnected from the line when the starter contacts are open; as there will be a completed connection to the load side of the starter in series with the autotransformer. This would be a shock hazard to anyone who came in contact with the motor lead even while the motor was not running. It would also be contrary to the National Electrical Code recommendations as shown in Article 430, paragraph 4328.

There is also one feature shown in the pushbutton circuit which should not be overlooked. The starter could be closed by the start button even when the stop button is being held or locked in the open position. The motor could thus be started and would continue to run as long as the start button is held closed. This might cause an injury to someone working on the machine. This



is especially true if the lock type stop button is used.

The station can be wired using only four wires, if only one start and stop station is used. If two or more stations are used, one additional wire will be necessary.

By wiring as shown in the following drawing, the load side of the starter will have no live conductors when the starter is in the open position and the starter cannot be closed by the start button if the stop button is locked or held in the open position.—C.A.S.

Reversal of Watthour Meter

QUESTION F20—*We have an m.g. set feeding a haulage line on which are used combination trolley and battery locomotives. The set consists of a 300 hp, 2300 volt synchronous motor driving a 200 kw, 275 volt compound generator. We have trouble maintaining the voltage on the set. The set builds up normally, and after three or four minutes it loses its voltage suddenly and by cutting out all the resistance of the rheostat we can barely maintain the correct voltage. At the same instant the voltage drops the synchronizing relay on, the motor starter drops out and the watthour meter stops and reverses. The rheostat checks O.K. Could someone please suggest the trouble and what makes the watthour meter reverse?*—E.T.

ANSWER TO F20—The symptoms described give every indication that the motor generator set is being reversed.

Reversal of the watthour meter shows that the synchronous motor is acting as a generator and supplying power to the line. Loss of voltage on the generator indicates that the current in the series field is reversing, thus causing the generator to perform as a differentially compounded motor. Runaway is prevented because of the connection to the power system through the synchronous motor. A direct current machine will operate either as a generator or a motor, with the direction of rotation and the line

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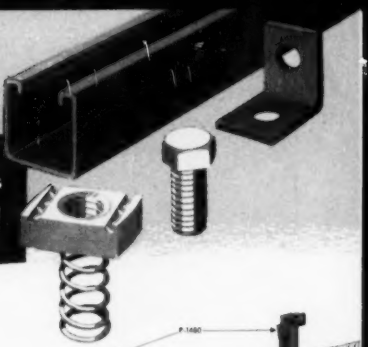

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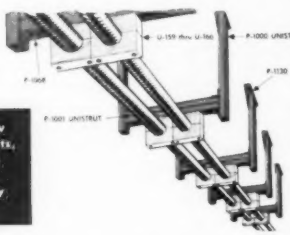
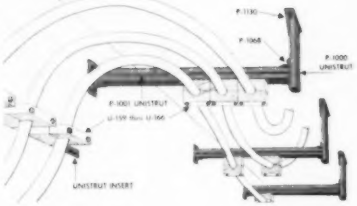
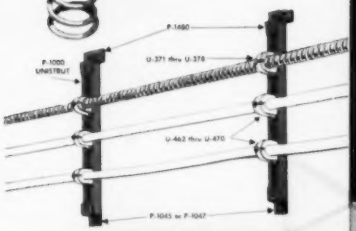
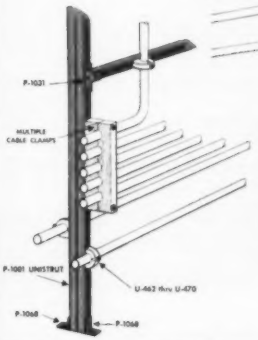


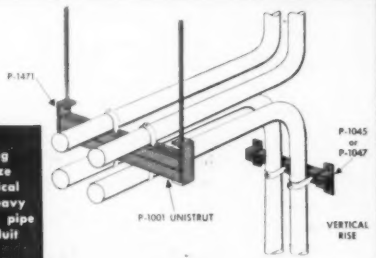
Two examples of how UNISTRUT concrete inserts, channel, fittings and maple insulating clamps support heavy overhead cable.



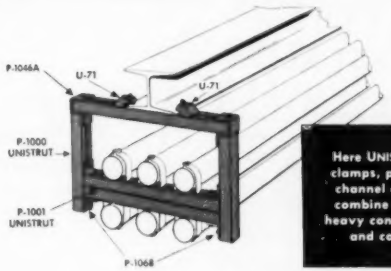




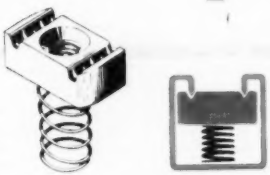
Here maple and porcelain cable clamps insulate conduit in UNISTRUT column-mounted assembly (at left) and cable in horizontal wall mounting (above).



UNISTRUT framing assembly (trapeze hanging and vertical rise) supporting heavy conduit. Note how pipe clamps hold conduit firmly.



Here UNISTRUT beam clamps, pipe clamps, channel and fittings combine to suspend heavy conduit securely and compactly.



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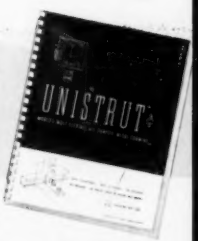

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polarity the same in either case. But, in one case, the armature current will be reversed as compared to the other case.

If this is the only machine, reversal may be due to the locomotive operators employing regenerative braking. This could be done in a number of ways, the most common being to brake by notching the motor after connecting in reverse. If such is the case, the generator is small compared to load.

If the motor generator is operated in parallel with other machines, investigation should be made of the physical and electrical characteristics of all of the direct current generators. If one has a rising voltage characteristic, as compared to the others, it will tend to "hog" the load even so far as to cause the others to operate as motors.

Compound wound generators will not operate satisfactorily in parallel unless there is an equalizer connection. This is a connection between all machines and is made at the point where the armature connects to the series field. Having a low resistance, it causes all series field circuits to take more or less equal shares of the line current. To be successful, naturally, all series fields must be connected to the same bus, whether it be positive or negative. Also, all machines must be either long shunt or short shunt alike.

If one series field has a shunt, the equalizer causes all the series fields to be shunted. Therefore, in order to balance the load division of machines not having similar voltage curves under load, resistances must be placed in SERIES with the armature circuit.

A compound generator often will work satisfactorily in parallel with a shunt generator, but the compound machine may seize the load.—L.E.B.

Protection for Transformer

QUESTION G20—*Would a 7200 volt, 600 amp oil circuit breaker be a positive protection for a 300 kva three phase transformer to be installed on the secondary side which is 2300 volts?* —E.S.H.

ANSWER TO G20—Using the 7200 volt, 600 ampere oil circuit breaker as a secondary breaker would provide a high degree of protection for the 300 kva three phase transformer when faults occur on the secondary (2300 volt) system.

Although the model number or manufacturer of the breaker is not given, a breaker of this type should be good

for three phase fault interrupting rating of 50,000 kva and a current interrupting rating of 4000 amperes at rated voltage with a maximum interrupting capacity current limitation of approximately 12,500 amperes at reduced voltage. These ratings can be obtained from the manufacturer of the equipment.

From calculations the following data may be obtained to show that the breaker will successfully handle the job. The line current for the secondary of the transformer at full load is 75 amperes, much less than rated load current of the breaker. For the purposes of calculations, consider as having an infinite bus (unlimited power source) at the transformer primary, and the transformer impedance is assumed to be about 5%. With the above assumptions it is possible to calculate a maximum three phase fault which will be higher than any ever received for an actual fault. The calculated value for a three phase fault is 6000 kva and this would give a maximum line current of 1500 amperes, both figures are well under the breaker rating.—R.L.S.

ANSWER TO G20—The absolute answer to the question can only be given by the manufacturer of the oil circuit breaker. With a short circuit at the secondary line side of the breaker when installed on the 2300 volt side, assuming full sustained voltage on the high voltage side, and transformer reactance of 5%, the breaker duty required would be of the order of 6000 kva or about 1500 amperes at 2300 volts, three phase. The breaker manufacturer can tell at once whether this duty requirement can be met.—C.O.D.

Compensators

QUESTION H20—*At our plant we have several surplus 50 hp 2300 volt motor starting compensators. Would it be practical to use these on 440 volts?*—W.P.R.

ANSWER TO H20—The answer to your question is "No".

First—The current required by a 440 volt motor is over five times that required by a 2300 volt machine. All your current carrying parts and contacts are too light, they will heat up, cause trouble, and may burn out.

Second—The voltage (440) is so low that only about 1/5 of the current required to operate the motor will go through the windings of the autotransformer when starting, probably the motor would not start at all.

Third—The retaining coil on the

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starter would have to be rewound for 440 volts as the coil would not lift the armature.

If you are taking power from a utility company they will probably have no objection to your using across-the-line motor starting switches. These will be all right for you as long as the motors do not have a very heavy load when starting or are of very old type. Motors of several hundred hp are started that way now. If you are taking power from a small power plant, either local or private, they may cause a slight disturbance on the line. This should not be serious unless the plant is very small. I suggest trying one. —A.E.T.

ANSWER TO QUESTION H20—The contacts will become rated 10 hp, 440 volts. The autotransformers will supply a slightly different secondary voltage rated at 10 hp, 440 volts. The solenoid voltage will have to be provided by a transformer, unless it is rated 440 volts.—H.S.

Pressure Limit Switch

QUESTION J20—*Will a pressure limit switch on a hot water boiler work if set at 26 lbs. and a two pound differential, to prevent the water from going out when the pressure goes up to 30 lbs?*—H.S.

ANSWER TO J20—From the wording of the question it indicates that the hot water boiler is one as used on a hot water heating plant, that is, one that is connected by piping to radiators for furnishing heat and that it is a closed system not using an expansion tank to hold the surplus water when the water expands due to temperature increase.

This system has the advantage over the open type system in that the water can be raised to a higher temperature under pressure without boiling than it could in an open system using an expansion tank.

The system is usually connected to a pressure water supply fed through a check valve to prevent back pressure in the water line and has a pressure reducing valve which reduces the pressure to about 15 pounds and keeps the entire system full of water at not less than 15 pounds.

When the water heats up it expands requiring more space, and there being no place to expand, it raises the pressure of the system until it reaches 30 pounds, at which time an overflow valve opens allowing some of the water to escape usually on the cellar floor directly below the valve.

When the boiler is banked or the heat goes down, the water cools returning to near its former density, at which time the pressure reducing valve will feed in enough fresh water to prevent the pressure going below 15 pounds as would be the case if no fresh water was fed into the boiler at this time.

As long as there are intermittent periods of low-fire and high-fire there will be an overflow every time the water temperature increases enough to cause the overflow valve to open due to increased pressure. If a steady fire is carried, the pressure will remain inside the 30 pound limit and no overflow will occur. The thermostat and damper regulators can be adjusted for this purpose.

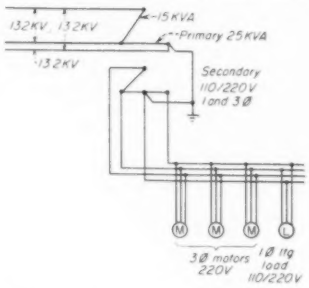
The overflow pipe is a safety device and should never have a valve of any kind on it. About once a month the overflow valve should be tested by running the water temperature up high enough to cause the valve to open and release some water. This will insure that the valve is in safe operating condition should the need arise due to some of the other controls failing to operate.—E.E.M.

Can you ANSWER these QUESTIONS?

QUESTION V20 —Here is a question that has caused us and a utility a headache. We wired a garage three years ago, divided it up according to the code and connected it to a 4 wire 3 phase service. The utility has a rate for installations of this kind using lights, power, and some forms of heat on the 4 wire meter. This job worked fine until last November when it was noticed that the meter reading was not in line with what it should have been. In December the reading was definitely behind what it had been in October. The utility changed the meter, but the trouble was still present, and then they called us in to check the building. We found that one circuit consisting of a stoker motor and two unit heaters would cause the meter to run in reverse, any one of these motors having the same effect. These units all check perfect, so we then switched this circuit on to the other leg and the meter ran O.K. We then connected the balance of the heating plant, consisting of two unit heaters, to the leg that the first circuit was connected to and the same old trouble immediately showed up.

The service is fed from an open delta transformer, with the neutral carried solid from the transformer to the service equipment and on to these motors. The transformer is grounded and the service is grounded and the drop from the transformer is about 50 feet from the building.—G.F.P.

QUESTION W20 —When transformers are connected "open" delta to an REA 13.2 kv line with one "hot" leg grounded as shown in the accompanying diagram, why should the three phase motors (5 of them) have different currents in each of the three motor



leads. This occurs on any one motor, or all motors, whether or not the single phase lighting load is connected. The currents vary 20% to 40% above the normal full load motor current. The voltages, phase to phase, are approximately equal at the motor starters or terminals.

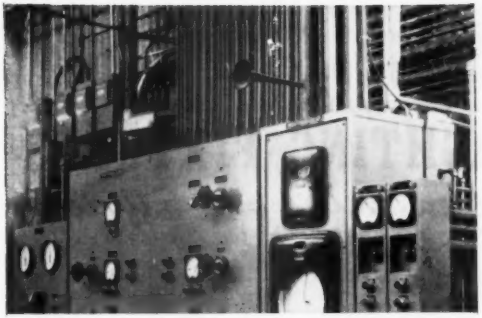
The five three phase motors were manufactured by three different well known manufacturers.—W.L.T.

QUESTION X20—Why can a zero adjuster be used on ac voltmeters and ammeters when we know that these meters cannot be read near the zero mark?—H. S.

QUESTION Y20—What is the easiest method of determining if a substation ground for lightning arrestors and transformer tanks is satisfactory?—D.H.N.

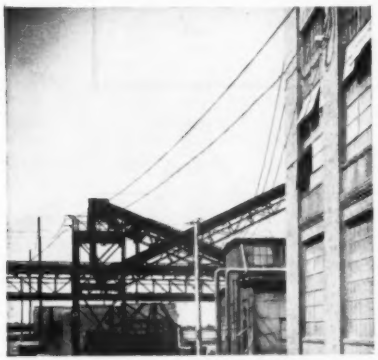
QUESTION Z20 —As long as a certain switch is closed in our plant I want to get a series of strokes on a single stroke bell. This is to distinguish the signal from ordinary bells. Auxiliary contacts are available for closing a signal circuit. Can this be accomplished using only one relay and without any rotating coding device? —P.S.

PLEASE SEND IN YOUR ANSWERS BY MAY 15

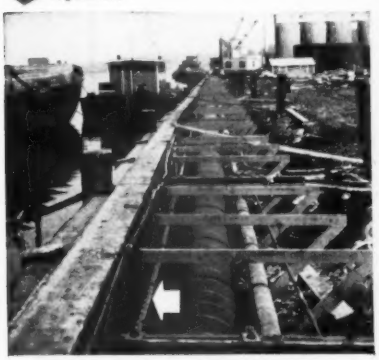


Maze of conduit carries Okolite-Okoprene control and power wiring from control panel to Kamyr Pulp Drying Machine. A major portion of the equipment in the motor generator substation is also controlled from this switchboard.

Motor generator room, showing 2300 entrance breakers, 550-volt distribution breakers, motor generator set and electronic speed regulator cubicles. All of these, both a-c and d-c, are fed by Okolite-Okoprene cable.



Okolite-Okoprene self-supporting aerial cables distribute power to transformer sub-stations from the Power House. "Stormsafe" aerial cable eliminates congestion, reduces clearance problems, and provides triple economy of quick installation, low maintenance costs and better voltage regulation.



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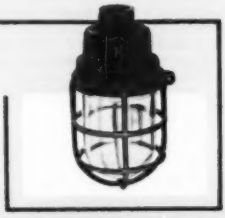

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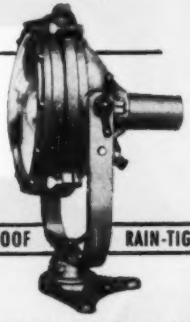

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GLENN ROWELL, *Electrical Engineer, Fire Underwriters Inspection Bureau, Minneapolis, Minn.*

B. Z. SEGALL, *Executive Vice President and Chief Engineer, Best Electric Co., Inc., New Orleans, La.*

F. N. M. SQUIRES, *Chief Inspector, New York Board of Fire Underwriters, New York, N. Y.*

Lighting Circuits

Q. *We have just completed the electrical installation in a rather large terminal grain elevator and the local inspector has refused to accept the installation inasmuch as he states the method we have used for obtaining lighting circuits is contrary to the Code. This building is served direct from the utility primary at 13,800 volts and has its own bank of transformers to furnish three phase 440 volts for the power installation. These transformers are delta connected and we grounded one phase to assure safe operation of our motors. At five different points in the plant, we have placed small transformers between the two ungrounded phases to obtain a 110 volt lighting circuit to supply illumination in that area. The secondary on each one of these small transformer installations is grounded to a cold water pipe and the inspector claims this use of individual transformers at several locations is contrary to the Code. Will this installation have to be revised to comply with the present edition of the Code?*—H.W.M.

A. Yes, an installation such as you have described is a violation of Code requirements. You will note that Section 2002 reads as follows: "No interior wiring shall be electrically connected to a supply system unless the latter contains, for any grounded conductor of the interior system, a corresponding conductor which is grounded."

You will also note under Section 2001 that all interior wiring systems used to supply ordinary lighting outlets shall have a grounded conductor which is continuously identified throughout the system.

Then, under Section 2523 you will find that where secondary alternating-current circuits, such as those supplying lighting, must be grounded, the Code requires that the secondary distribution system must be grounded on the supply side of the service disconnecting means and at least at one additional point somewhere further back on the secondary, either at the transformer supplying the secondary or elsewhere.

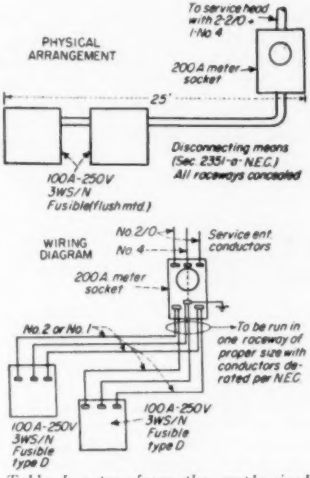
Under Section 2005, permission is given to derive a lighting service from a four wire delta connected secondary by using the mid-point of one phase as the point of origin of the fourth wire or neutral conductor. Therefore, for the installation in question, you should obtain the neutral from the mid-point of one phase on the delta connected transformer bank and provide a ground for the neutral at that location and also a ground for the neutral at the service equipment supplying the lighting load to the building.—G.R.

Service Switches

Q. *In this area, where considerable electric heating is used in residences, we go by Section 2351-a which permits up to six separate switches as a service disconnecting means. Quite often it works out, for example, that the heat load can be served through a 100-ampere fusible switch with its associated panel and the usual domestic load through another such combination, thus eliminating an unsightly 200-ampere so-called "main switch".*

Many times it is desirable to have a completely flush-mounted disconnecting means resulting in concealed raceway. If we are using two No. 2/0 and a No. 4 neutral for service entrance conductors, we would probably violate the N.E.C. to tap these within one of the switch enclosures for carrying, say, No. 2 conductor to the line side of each of the switches (Sec. 3737-b), due to lack of space within the switch.

Now for the question:—Referring to the sketches, note that we are assuming the use of a 200-ampere meter socket located less than 25 ft. from the more distant switch. Are we in violation to run separate taps in the same raceway, properly de-rated per Table I notes, from the ample-sized lugs of the meter base to each 100-ampere switch?


PHYSICAL ARRANGEMENT
To service head with 2-2/0 + 1-No 4
200 A meter socket
25'
Disconnecting means (Sec 2351-a-N.E.C.) All raceways concealed
100 A-250 V 3WS/N Fusible(flush mtd.)
WIRING DIAGRAM
No 2/0
No 4
Service ent conductors
200 A meter socket
No 2 or No 1
To be run in one raceway of proper size with conductors de-rated per N.E.C.
100 A-250 V 3WS/N Fusible type D
100 A-250 V 3WS/N Fusible type D

I can see that some may say that Sec. 3105 applies, but it seems more likely to me that Sec. 2434-d applies. Please let us have your opinion.—L.C.B.

A. According to your diagrams, you are running two separate taps in the same raceway from the meter socket and each tap feeds a 100-ampere main switch. I believe such procedure is permitted by Section 2305-b of the Code provided the terminals in the meter enclosure are approved to be used with two conductors as covered by Section 1117. Section 3105 covering conductors in multiple is not involved because the conductors are not run in multiple. Section 2434-d covering the 25 ft. tap rule is not involved since the conductors to which the taps are made are service conductors and are not protected by overcurrent devices. Since you mention 25 ft., I assume you mean that this is permitted by Section 2434-d. This is not correct since the service disconnect must be located at a readily accessible point nearest to

the entrance of the service conductors. The principal violation of your proposal concerns Section 3737b which does not permit switch enclosures, unless of special design, to be used as troughs or raceways for conductors feeding through to other switches. It appears to me that an auxiliary gutter, covered by Article 374, installed adjacent to the top of both switches, with a flush cover, would partially satisfy the ends desired. Such procedure would eliminate the necessity for the two taps. I believe we all agree that Section 3737b is more than justified in view of past experience but it does occasionally promote difficult situations to handle as shown by your case. —B.A.McD.

Asbestos Wire

Q. *On a recessed fixture installation, may asbestos wire be used from fixture to fixture?*—W.G.B.

A. If you have reference to fixture wire such as Type AF, AFC, AFPO, or AFFV, you will note under Section 4179 that not more than six feet of fixture wire shall be run from a fixture to a box located not more than one foot distant from the fixture. On the other hand, if you have reference to regular building wire, such as Type AVA, which is suitable for use in dry locations, the answer is, yes it could be run from one recess fixture to the next, in fact it could be used for the complete lighting circuit, the only limitation being it shall be used only in a dry location.—G.R.

Good Workmanship

Q. *I was under the impression that the Code had a provision which required that all unnecessary and complicated wiring had to be avoided. In my 1951 Code, I cannot locate this requirement. Will you kindly advise where it may be found?* —D.W.

A. This provision last appeared in the 1949 edition of the Code, Section 1105, Mechanical Execution of Work. This provision does not appear in the 1951 Code and I know of no other place in the Code where it is recognized. The sentence "Conductors, raceways and equipment shall be carefully secured in place and attached to fittings" also was eliminated from Section 1105. I can understand why this last sentence was eliminated since it is duplicated in other parts of the Code but I do not fully understand the reason for the elimination of the requirement in question. As I recall, the wiring of some prefabricated houses were involved with this requirement.—B.A.McD.

Grounding

Q. *On a farm installation where the meter loop, is located on a yard pole and services to the dwelling and other buildings extend from this pole underground, is it necessary to provide a ground for the neutral at the pole if the neutrals are grounded to the underground water system at the other buildings which they serve?* —J.S.

A. As yet I do not believe the National Electrical Code contains an answer to your question. However, it is common practice in some states, and I believe by the R.E.A. at Washington, to require the grounding of the neutral at the meter loop when such loop is located on a yard pole. It certainly is a good practice to follow as such a ground is likely to keep high voltage surges off from underground runs to the other buildings and lessen the likelihood of their being damaged by such surges. We also believe it advisable to caution against the grounding of the neutral to an underground water pipe which serves buildings housing livestock unless such a pipe has an insulating section in a vertical run above ground between the point of electrical neutral ground and possible contact with livestock due to their susceptibility to electrical shock hazards, as a current which a human can barely feel will interfere with milk production of cattle and currents as small as 35 milliamperes at more than 25 volts can cause electrocution of livestock.—G.R.

Motor Wiring

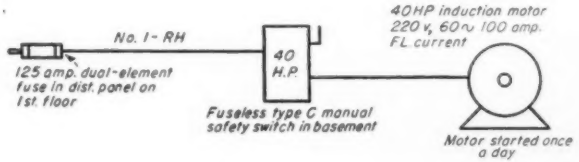
Q. *Is there any N. E. Code violation in the arrangement, shown by the sketch, for wiring a 40 hp. motor?*—P.R.G.

A. According to your sketch you show a 40 hp. induction type motor, apparently three phase, 220 volts, 60 cycles, with a full load current rating of 100 amperes. While this may be the name-plate rating on the motor, the value of 104 amperes shown in Table 24 must be used. The fine print note at the top of Table covers this point. This requirement enables contractors who are estimating motor circuit costs, when name-plate ratings are not available, to use a full load current rating, common to all and recognized by the Code. In some cases it may mean the difference of a wire and conduit size. In your example there is no difference since the size of conductor must be 125% of 104. This results in 130 amperes which is the rating of the No. 1 R.H. conductors shown.

The next question concerns the use of a 40 hp rated switch as both the controller and disconnecting means for the motor. Section 4407 of the Code recognizes such procedure with reservations. The Electrical Utility, however, is interested in such procedure and should be consulted before throwing a 40 hp motor on the line without a compensator type of controller.

The next point concerns a 125 ampere fuse acting in the dual capacity of protecting the motor and also the motor circuit conductors. Such procedure is recognized by Code Sections 4344 and 4346 with reservations. The Code says "where the authority enforcing this Code is satisfied that the conditions of maintenance and supervision provide that appropriate fuses for the starting characteristics of the motor will be continually available, fuse-holders of a smaller size than specified by Table 20 may be used". This requirement leaves it up to the Inspector to decide where and how this rule may be applied. Some special fuses have long time-lag and are capable of protecting both the motor and the conductors. It also follows, however, that the starting characteristics of some motors result in high starting currents for longer than usual periods. Under such conditions even the special time-delay fuses will fail to take this starting current without blowing. Usually the question is reviewed by the inspector and if he feels that Section 4346 of the Code will be satisfied, he will permit the installation.

I assume the switch is within sight from the motor location.—B.A.McD.


No. 1 - RH
125 amp. dual-element fuse in dist. panel on 1st floor
40 H.P.
Fuseless type C manual safety switch in basement
40 HP induction motor
220 v, 60~ 100 amp. FL current
Motor started once a day

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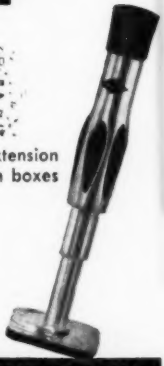

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Grounding Outlet Boxes

Q. *In using non-metallic type wiring with an equipment grounding conductor to ground all metal outlet and switch boxes, fittings or cabinets as covered by Chapter 6, Section 3409; Chapter 19, Section 2542, would lead to think that switch and outlet boxes in bathrooms would be the only ones to ground.*—C.W.K.

A. The Chapters mentioned above appear to be those designated in Mr. Abbott's Code Handbook. Section 3409 requires boxes, fittings or cabinets when used with non-metallic waterproof wiring to be grounded in accordance with Article 250. Section 2542 covers the grounding of fixed equipment and the provisions covered by paragraph b, c and d covers a lot of ground. They tell us that any non-current-carrying metal parts of fixed equipment which are liable to become energized must be grounded when they are located in wet locations and not isolated; when the equipment is located within reach of a person who can make contact with any grounded surface or object; when equipment is located within reach of a person standing on ground. Applying these Code provisions to a residential occupancy, you may find that every part of the house is involved. Equipment located in the basement within reach of concrete floors or gas pipes or water pipes or possibly heating equipment or wash tubs, must be grounded. Equipment located in kitchens near plumbing fixtures, gas ranges, grounded electric ranges or refrigerators or automatic washing machines, must be grounded. The bathroom is another location where the same reasoning applies. The living room and bedrooms are not involved to the same degree but they may have grounded floor or wall radiators, steam or hot water radiators or electrical heating units, all of which presents the same problem of grounding when outlets are installed within reach of same. The dwelling may have partitions constructed of metal lathe and plaster and any equipment installed in such walls must be grounded. The same reasoning applies to other occupancies where, for example, metal fixtures and outlet boxes located on ceilings are within reach of sprinkler pipes, water pipes, gas pipes etc.

This question of grounding equipment used in connection with non-metallic sheathed cable wiring may be satisfied to a degree by using non-metallic boxes, plates and fixtures. The question of satisfying the requirements of Section 2542 is quite involved and special attention should be given each installation if full compliance is to be attained.—B.A.McD.

Wiring for a Petroleum Tank Farm

Q. *We are considering bidding on the wiring job at a small petroleum tank farm and we note the wiring specifications for some of the buildings on this property call for ordinary wiring materials and devices. How far must a building be from points at which gasoline is handled before it is possible to wire it with ordinary wiring methods?*

A. It is impossible for a code to fix a safe distance between a point at which flammable volatile liquids are stored, handled or used as each such installation presents a somewhat different problem. Section 5157 of the Code states that office buildings, boiler rooms, and other building units isolated by location and in which no gasoline or containers are used or stored may be wired with any of the wiring methods provided for in Chapter 3 of the Code. As all volatile flammable liquids derived from petroleum have vapors which are heavier than air, the topography of the ground plays an important part in determining the distances necessary between safe and hazardous areas. The construction of dikes also plays an important part in such distances as these vapors like the liquid may be contained within diked areas. Therefore it might be perfectly possible to have an office building located within a comparatively short distance of a gasoline pump house, for instance, if a dike were located between the two or if the ground sloped rapidly from the office building toward the pump house. Flammable vapor-air mixtures have been ignited at distances over 1,000 feet from their source, hence distance alone cannot be used as a measuring guide. In addition to dikes and ground topography, prevailing winds should also be considered for any specific area, especially where farms of any appreciable size are encountered. Therefore I would suggest you contact the electrical inspector having jurisdiction in that area, a representative of the owners of the tank farm, and then determine which areas can be considered safe for the use of ordinary wiring materials.

Some of the larger oil companies have desired to use ordinary electrical equipment for control of their motor circuits and therefore have erected a motor control building in the approximate center of their tank farm with dikes isolating all tanked storage of highly volatile liquids from this space and have placed the control building on an open steel framework so the floor of the building is at least five feet above grade giving air currents a free sweep beneath the building so no possible accumulation of vapors can form there. This space cannot, of course, be completely surrounded with dikes or it might possibly fill to the level of the dike. Hence, on the downhill side an opening must be provided for natural drainage of any vapors which might accidentally get into the area in which the control building is located. Other nonhazardous buildings, such as office, garage, warehouses for storage of other than volatile liquids, etc., need not, of course, be centrally located and may therefore be isolated more readily from the storage of highly volatile flammable liquids. —G.R.

Crane Conductors

Q. *According to Article 610, Paragraph 6112a, N. E. Code on Cranes and Hoists, AVA and AVB conductors 500,000 cir. mil. do not carry as much current as 500,000 cir. mil. Types R or T conductors. Please explain why*—A.H.H.

A. We have checked the above statement and find that you are correct and that the Code recognizes the following current-carrying capacities for crane conductors.

For a motor having a 30 and 60 minute short-time rating, a 500,000 cir. mil. conductor has the following rating:

R or T insulation—620 amps
AVA insulation—470 + 47 = 517 amps
AVB insulation—405 + 40 = 445 amps

For a motor having a 5-15 minute short-time rating we get the following:

R or T insulation—680 amps
AVA insulation—517 amps
AVB insulation—445 amps

Since it was impossible for us to find any logical answer to your question which concerns the reason why a Type R or T conductor should carry more current than a Type V conductor, we consulted a member of Panel No. 12 of the Electrical Section of the National Fire Protection Association for verification of our opinion. As a result we offer the following:

When the 1940 Code was adopted, you may recall that the carrying capacity of conductors, Table No. 1, were greatly reduced. For example, 500,000 cir. mil. cable was derated from 400 amps. to 265 amps. In view of the intermittent loading of cranes and hoists, it was felt that this derating would result in conductor sizes for in excess of requirements for such applications. As a result it was decided to adopt a Table specified in

the Canadian Electrical Code which seemed to properly take care of the condition. This Table only covered rubber conductors as high as 4 naught and you will note that the discrepancy pointed out by you is not pronounced in sizes of conductors up to 4 naught. This Code change was handled through Interim Amendment No. 61, which later was revised to cover conductors up to 500,000 cir. mil. It appears at that time no attention was given to the inconsistency in current values for different insulations. There is no reason why Types R and T conductors should carry more current than a Type V conductor. In view of the fact that your question has been called to the attention of Panel No. 12, it is quite possible that the discrepancy will be corrected.—B.A.McD.

Receptacles In Garages

Q. *In regard to Section 5105 of the National Electrical Code, is a standard duplex receptacle, mounted in a F. S. box, four feet above the floor, approved in a garage repair shop of approximately ten cars? This is the usual way of installing this type outlet for extension cords, electric drills, etc., but it seems to conflict with Section 5105 which seems to imply that a female receptacle must hang from a cord or other flexible connection at the point of connection to the outlet box.*—C.M.A.

A. This question which you have raised received considerable attention at a meeting of the Empire Chapter, IAEI recently held in Corning, N. Y. In view of conflicting opinions on the point raised, it was decided at that time to request an official interpretation of the Electrical Committee of the N.F.P.A. When this decision is given, it will definitely answer your question.

Since you have requested our opinion in this matter, we are pleased to submit the following background of this rule in support of same.

In the 1915 edition of the Code, this rule first appeared and the wording then was substantially the same as it is today in the 1951 Code. That was 36 years ago and unless the records show the intent of the rule at that time, it may be difficult at this time to obtain from a 1915 member of the Article Committee covering Garages, the intent at that time.

On December 10, 1930 the magazine, *Electrical Contracting*, predecessor to *Electrical Construction and Maintenance*, published a book covering Code questions. The question and

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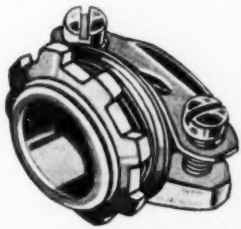

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answer to your problem at that time follows:

"Q. What are the wiring requirements for portables in garages?

A. Inspection departments are having trouble securing compliance with rule 3303-A by the electrical contractors. Because the rule does not start off by saying that receptacles of the flush or screw base type must not be used in garages, inspectors find that a good many of these are used in place of the required separable connector.

In supplying a garage with portable lamps the following points must be remembered: Hard service cord or its equivalent must be used. Separable (pin-plug) connectors hung by means of approved flexible cord are to be used in place of flush or other receptacles. These are to be installed so as to be 4 feet or more above the floor.

It is recommended that in installing a garage job, outlet boxes which may be provided with covers be installed about 5 feet above the finished floor line. Then a short piece of the heavy duty cord is to be connected to the circuit wires within the box and leave the box through a well rounded or bushed hole either in the cover or side of the box. The other end of this cord is to be connected to the female part of the pin-plug connector. The cord is to be so secured within the box and connector that no strain will be placed on either connections or splices and to be of such length that the connector will hang at least 4 feet clear of the floor. The reason for suspending the connector in this manner is so that the connector may follow the direction of any strain on the cord and readily pull apart rather than damage any part of the circuit. As the connector is continually subject to such strains and is often located over a concrete floor it should be made of some material which will not break from being dropped on a hard surface."

In 1933 another well known Code authority commented on this rule as follows: "The latter part of the rule, regarding pin-plug connectors, is evidently intended to apply only where a cord connector is suspended on a pendant cord that is permanently connected to the circuit wires at an outlet."

In line with this comment it appears reasonable to assume that fixed receptacles could be used in garages for portables.

In 1947, however, this Authority made another comment as follows on this rule which definitely answers your question: "Section 5105. In any occupancy within the scope of this Chapter, the use of a fixed attachment-plug receptacle is not permitted. Any outlet for the attachment of a portable cord must consist of a permanently attached cord terminating in a cord connector. The cord may be attached to either a wall or ceiling outlet."

Official Interpretation No. 320 issued April 18, 1949 also has some bearing on your question. It reads as follows:

Question. Does Section 5121 permit the use of the flush type attachment receptacle in a one car private residential garage, provided it is kept 4 feet or more above the floor, or does Section 5105 govern?

Answer. The very special type described in Section 5105 is not called for.

This official interpretation indicates to me that, except for residential storage garages, a special type receptacle as described in 5105 must be used for connecting portable appliances. The ordinary receptacle would not satisfy Section 5105.—B.A.McD.

Appliance Circuit

Q. *In a small four room house which has no regular dining room and not even an L off the living room but in which it is possible to utilize part of the living room as a dining room, is it necessary that an outlet be located on the appliance circuit in that portion of the living room used for dining purposes?*—J.A.N.

A. Under subsection 2115 b., we find the requirement for the appliance circuit to be run to all convenience outlets, other than clock outlets, in a kitchen, laundry, pantry, dining room and breakfast room of dwelling occupancies. It therefore is necessary for the contractor or the electrical inspector to determine the usage to which the various rooms of a dwelling will be put. Obviously a four room dwelling which does not have a regular dining room, in which the kitchen is too small to provide necessary dining space, will have to use some other portion of one of the other rooms. On the other hand, it is also possible the kitchen may contain dining space and that the living room might only be used very occasionally and therefore could not be considered the regular dining location. For this reason most inspectors depend upon the type of furnishings and where a portion of a living room contains regular dining room furniture or is intended to contain such furniture, they assume that room may be used as a combination living and dining room and require at least one outlet on the appliance circuit as close as possible to the area to be so used.—G.R.

Controller Disconnect

Q. *Must manual line disconnects be used ahead of all magnetic starters with overload protection? Magnetic starters are operated by three point start-stop switches.*—P.R.G.

A. Sections 4401 to 4411 of the Code covers the requirements for disconnecting a motor and its controller from the circuit. According to these sections a magnetic controller including all of the wiring involved with the remote control circuit must be individually disconnected when the disconnecting means is in the open position, with the exception covered by Section 4410 which permits, under stipulated conditions, the grouping of motors under one disconnecting means. The fact that you do have electrical control of the motor through the magnetic control start-stop switches is not sufficient to satisfy the Code. Magnetic controllers may fail to operate under stalled rotor conditions, overloads, or other abnormal conditions. When such conditions occur, the manually operable switch required by the Code may be used to disconnect the motor and its controller from the circuit and thus eliminate fire.

Official NEC Interpretations

INTERPRETATION NO. 376

(Issued Jan. 29, 1952)

SECTION 7021-b—Emergency and Exit Light Systems

QUESTION: Where exit lights in a theater are supplied by a separate circuit from an independent current supply and none of the other emergency lights are on this same circuit, does this circuit constitute one of the two or more separate and complete systems contemplated by paragraph "b" of Section 7021?

Answer: No.

INTERPRETATION NO. 379

(Issued Feb. 8, 1952)

SECTION 2332—Mechanical Protection of Service Conductors

QUESTION: Is it the intent of Section 2332 of the 1951 edition of the National Electrical Code to classify all installations of service entrance cable on the exterior of a building between a sill plate and a meter socket, six feet above normal ground level, as exposed to mechanical injury

Answer: No, but some such installations might be exposed to mechanical injury and the local inspection authority will have to determine when additional mechanical protection is necessary.

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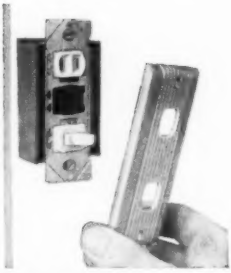

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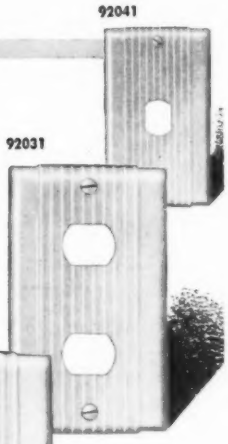

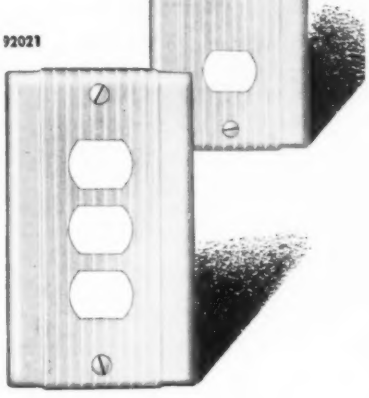

CHOOSE ANY COMBINATION FROM THESE DEVICES AND WALL PLATES

SWITCHES — Regular and Lock Types, Single and Double Pole, 3- and 4-Way.
CONVENIENCE OUTLETS, RADIO OUTLETS, PILOT AND NIGHT LIGHTS — Flush and Hooded, Clear or Red Lamps.
BELL PUSHES, WALL PLATES, 1-, 2- and 3-Gang Types for 1 to 6 Units.

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BRANCHES IN: BOSTON, CHICAGO, DALLAS, DENVER, DETROIT, LOS ANGELES, NEW YORK, PHILADELPHIA, SAN FRANCISCO, SYRACUSE.
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WIRING DEVICES
ENCLOSED SWITCHES

ARROW ELECTRIC DIVISION
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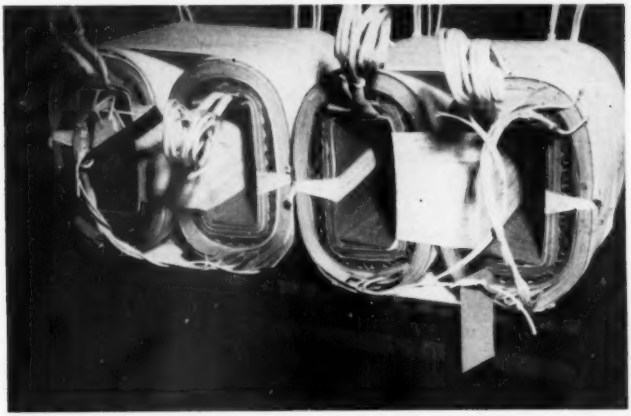
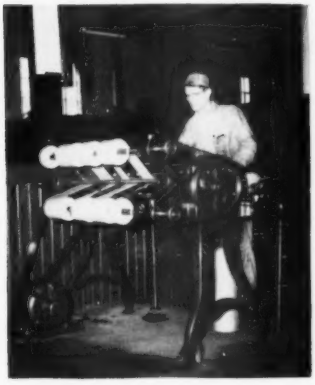
Motor Shops

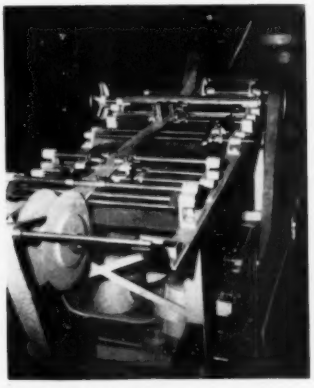


CORRUGATED OILWAYS between primary and secondary windings promote cooling and save installation time. Coils are tagged for future identification before being placed in transformer cases.

POPULAR SIZES of insulation paper are cut and folded during slack periods, then conveniently stocked.



INSULATION PAPER is purchased in bulk 6-foot rolls, cut in half by hand saw, then cut to desired transformer winding widths by motor-driven cutting machine.



FOLDING MACHINE centers narrow strip of paper on wider one, bends edges of lower layer to hold two strips together. Double fold of edges builds up ridge.

Double Insulation Improves Dielectric

Ingenuity and attention to detail has solved the insulation problem in the new transformer shop of the Electric Motor Repair Company, Raleigh, N. C. By installing a paper cutting machine, owner Bob Ward can buy insulation in bulk 6-foot rolls, cut it to desired widths and chalk up a purchasing saving. Then, by simultaneously folding double sheets, the dielectric strength is improved and the edge thickness can be built up to match the diameter of the various layers of wire. Finally, by cutting popular-sized widths during slack periods and storing it conveniently to winding benches, time is cut to a minimum when orders pile up during busy seasons.

Paper is bought in 6-foot rolls, cut in half with a carpenter's hand saw, and the resultant 3-foot sections are placed on the lag spindle of the cutter. Knives are then positioned for cutting the paper in desired widths and the resultant smaller rolls are wound on twin secondary spindles.

Several shop-invented innovations improve the benefits of the paper. First: by using two layers of paper instead of one, the effectiveness of the insulation is greatly improved. In the rolling process, a narrow paper is centered on a wider strip by using adjustable guides. Then the wider paper is folded to build up the wire trough. The second innovation is the use of a folding die that puts two, rather than one fold in each edge and, as a result, doubles the thickness of the paper edges. With edges equal to the diameter of the wire, each layer lies flat when wound, resulting in a flatter, more workmanlike finished winding.

Electric Motor & Repair also uses corrugated fiber between primary and secondary windings instead of wooden dowels. With corrugated sheets it is possible to form the fiber to coincide with secondary forms, create greater surface area for cooling oil between windings and complete this operation faster than would be possible with wooden dowels.

Coils are identified for reference purposes by a numbered tag taped to the outside so that, if the transformer returns to the shop at a later date, the case history of the unit can be quickly located and checked.

In addition to a great saving in time and material cost, Electric Motor & Repair has found that these methods also contribute quality to the finished job.

The *Original Prod-Mount Voltage Tester* is the KNOPP

Patents Pending

Say "Goodbye to risky time-wasting fuss in testing" with the 5 main safety features in the KNOPP Voltage Tester: (1) original Prod-mounting Socket in housing making this tester easier, faster, and safer to use and ending time-wasting "three-handed" testing; (2) protection through Dual Indication of voltage by solenoid and neon lamp working independently; (3) positive scale readings; (4) signal by hum and vibration; and (5) thorough insulation throughout, even to the sharp point of each prod.

Well-built and shock-proof in a LAMINATED bakelite housing, the KNOPP Voltage Tester tells immediately and simply if circuit is open or closed; magnitude of voltage between 110 and 600; a-c or d-c, pure or rectified; 25 or 60 cycles—for testing old and new circuits, fuses, locating grounds, etc.

Get the widely used and reliable KNOPP Voltage Tester with the time-proved Prod-Mount, and other safety features from your dealer, or write for illustrated free, new descriptive Bulletin No. 425.

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Rolls REELY roll on ROLL-A-REEL

Go modern . . . save time . . . save labor . . . save cost.

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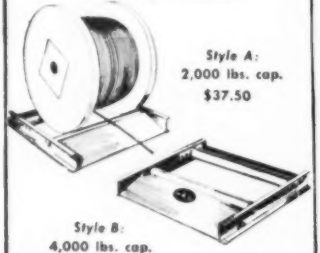
enables you to reel or unreel wire, cable, rope . . . easily, quickly . . . economically.

Adjustable slots for wide variety of reel sizes. Strong . . . with low slanted front and positive front lock for loading or unloading.



Style A: 2,000 lbs. cap. $37.50

Style B: 4,000 lbs. cap. $75.00

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Puller Removes Bearing Bracket Rings

A simple mechanical device provides quick and easy removal of bearing bracket rings at the modern motor repair shop of Lovatt Electric Service Company, Hackensack, N. J. Made up from a few spare pieces, the device, an idea of Arthur Lovatt, the company's owner, pulls rings off bearing brackets on the inside of end bells where it is difficult to pry the rings. With this puller, the necessity for splitting the rings to remove them is eliminated; time is saved; and rings are salvaged.

The puller is easily constructed from parts found in any shop. Two half bushings, 6 inches in length, are made of steel and have a narrow gripping lip around the inside circumference at the bottom end. When the two half bushings are clamped together to form a cylinder, these gripping lips form a smaller inside diameter at the one end. About 1-inch from the end opposite the lip end, a rectangular aperture is made in the center of each half-bushing, providing a channel through the cross section of the formed cylinder.

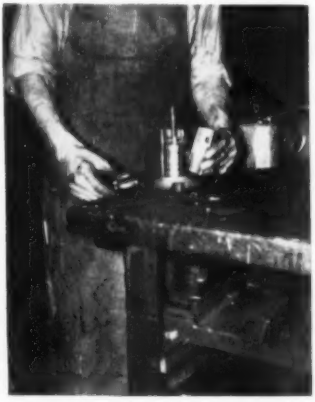
When the two half bushings with their diametric openings are brought together, a 4-inch metal bar is located in the cylinder with each end of the bar through one of the half bushing holes. A 7-inch threaded bolt is fed through a threaded hole in the bar.

To use the puller, the two half bushings are placed around the bearing bracket ring, with the gripping lips pressed between the bottom of the bracket ring and the inside face of the end bell. When the half bushings are formed around the ring, the bar and bolt arrangement is placed in position, with a solid cylindrical slug resting on the bearing directly beneath the bolt.

THREADED BOLT is taken up through the cross bar; the bolt presses on the bracket; cylinder grips and lifts the ring.

With all the parts in place, the enclosing cylinder is placed in a vise or held firmly with one hand. The bolt is then taken-up through the bar with a wrench. As the bolt comes down, it puts pressure on the solid slug, pressing against the bearing. Further pressure, by taking-up on the bolt, forces the cylinder up and lifts the ring which is gripped by the lips. The bolt is turned until the ring comes free of the bearing bracket.

The men in Lovatt's shop have found the device as effective as it is simple and use it often in the course of their work.



RING PULLER consists of two half bushings and a cross bar and bolt arrangement; removes rings from bearing brackets by exerting pull on ring and pressure against the bearing bracket.

Bounce Rod Drops Motor Stator

In many cases, the removal of the stator from a motor with only one removable end bell is a very difficult proposition. Not so, however, in the shop at Lovatt Electric Service Company, Hackensack, N. J. There, a simple "bounce rod" makes stator removal a cinch in such cases. With this rod and a small torch the stator is dropped from the frame without damage to the winding, laminations or housing.

The "bounce rod" itself is simply a 30-inch length of an old automobile brake rod with a soft lead disc or

BOUNCE ROD is clamped in a vise, and the motor frame with its solid cast end bracket is bounced up and down on the lead disc until the . . . . .

STATOR DROPS out of the housing. The torch nearby was used to quick heat the housing to expand it.

washer on one end. The rod was cut to length with the U shaped bolt eyes left on the end opposite the lead disc. The disc is secured to the one end with a couple of nuts and lock washers.

To use this "gimmick", the bolt eye end of the rod is passed through the stator and end bell, and the motor frame is lowered so that the lead disc comes in contact with the bearing bracket. The frame and the stator inside are then hanging from the rod. Next, the upper end of the rod (the bolt eye end) is tightened in a vise. The rod position is vertical with the motor frame hanging from the bottom end. The outer casing is heated around its circumference to expand the casing. The heat, applied with a torch, is quick and even to prevent damage to the stator winding inside. Then, the frame is lifted and bounced several times on the lead disc. Simply and quickly, the stator will drop from the casing. Because the lead disc is soft, bouncing the frame will not damage the bearing bracket.

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—completely eliminate annoying blinking and flickering of dead fluorescent lamps!

GUARANTEED — FOR ONE YEAR!

This is a glow switch condenserless precision starter equipped with automatic thermal relay circuit breaker. The relay automatically removes the lamp from the circuit electrically when the lamp becomes de-activated and automatically resets upon interruption of the lamp circuit.

SIMPLIFIES — Replacement of defective lamp automatically recycles starter circuit. No buttons to push — no replacement of starter.

REDUCES COST — Magno-Tronic starters provided exact timing of electrode heating, preventing excessive loss of emission material, thus assuring maximum possible lamp life.

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Demonstration and Literature on Request

SP-15-20 For use with 15 or 20 watt lamps.
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Manufactured under U. S. PATENTS

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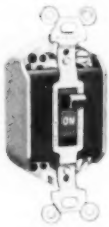

No. 3971
20 ampere
Grey Porcelain Cup
1-1/2" deep

Bryant offers the above lines of 20 and 30 ampere flush switches designed to handle the severe loads encountered in industrial and commercial installations. But, what is the procedure in determining the proper switch to handle these severe loads? For example, how would you select the proper switch for fluorescent lamp loads?

No. 5421
20 ampere
Bakelite Enclosed Cup
1-15/16" deep

Any electric circuit that includes an electro-magnetic device, such as a fluorescent lamp ballast, is an inductive circuit and THE NATIONAL ELECTRICAL Code requires:

"Switches controlling inductive loads shall have an ampere rating twice the ampere rating of the load, unless of a type approved as part of an assembly or for the purpose employed."

To determine the switch rating for a fluorescent lighting load, add together the primary current values marked on each ballast in the circuit and multiply the resultant figure by two.

EXAMPLE:

What switch should be used to control a fluorescent lamp circuit comprising 4 lighting fixtures, each fixture having four 40-watt lamps operating from two 2-lamp ballasts?

ANSWER:

The primary current (normal line amperes) marked on the 2-lamp ballast is 0.85 and as there are 8 ballasts, the total line current would be 0.85 x 8, or 6.80 amperes. Multiply this value by two — 6.8 x 2 = 13.6 amperes. Therefore a 20 ampere rated switch should be used.

No. 5431
30 ampere
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In The News

CMP Decontrol

Materials controls are on the way out—but it doesn't show anywhere outside Washington as yet. DPA Administrator Manly Fleischmann, boss of the Controlled Materials Plan, made it official late in March. CMP allotment of aluminum and most shapes and forms of steel, he said, probably can be dropped early in 1953. Controls may even be dropped on some steel—sheet and strip, particularly—before the end of 1952.

What this means to the electrical industry is chiefly a decrease in the mountain of paperwork involved in keeping records and filing forms required under CMP. By next January, or shortly thereafter, the industry should be ordering and using aluminum and steel again without awaiting government approval and assistance.

But complete decontrol of materials, though now in sight, still is a long way off. Allotment of copper will continue as long as that metal is critically scarce—at least another year or two. Since copper is so vital to electric power expansion and day-to-day operations, the industry's use of other metals necessarily will be limited to a considerable extent by the proportions of its quarterly allotments of copper.

On the other hand, mobilization officials have more or less committed themselves to an industry expansion program calling for installation of an additional 32-million kw in 1952-54. That means the industry can expect priority assistance or some other form of government aid in obtaining materials that cannot be secured otherwise.

Talk of easing materials controls represents a complete turn-around in the thinking of mobilization officials since last December. But Fleischmann or any of his aides can hardly be blamed for not foreseeing the switch. Their advance information on arms production schedules indicated that military demands for metals would hit peak in the third and fourth quarters of this year, that there would be no easing of these demands before 1953. Despite increasing production of steel and aluminum, coming in largely in the last half of 1952 and in 1953, military requirements stood to take all the increased supply and more.

What happened was that the armed services scaled down their arms production schedules. An idea of the proportions of the cutback in their plans is given by what happened to their appropriations request for the fiscal year starting next July 1st. Last summer, the military brass were talking of a budget for the year of more than $100-billions. Their first slash changed this to $85-billion. In December the final cut reduced this total to $52-billion.

But it took weeks to translate these proposed spending ceilings into terms of metals requirements. The job was complicated by the fact that the money cut was not to result in a reduction in the total supply of weapons to be produced. The services will order—and get—weapons in the same number. But they'll take a year longer, stretching the arms program through mid-1955 instead of winding it up a year earlier as they had planned.

That meant rejiggering of many contracts already placed, especially for aircraft. Delivery schedules were cut and stretched, to lower projected peak production rates and keep the line rolling longer.

Both copper and aluminum, though a little more is available, are being held out of consumer goods, including electric appliances. That's because additional aluminum producing capacity won't be in operation until later this year. Even then, consumer goods makers probably will not get more than half the copper they used before Korea.

When the government stops allocating steel and aluminum next year, it will have to rely on some type of priority system. That's a problem Fleischmann and his staff are wrestling with now.

To keep faster-moving, more experienced industry from grabbing most of the steel and aluminum, the armed services will have to have some sort of ticket for their requirements. Fleischmann would like to give them

NEW OFFICERS of the Minnesota Electrical Association hold post-session huddle at recent St. Paul convention. Retiring president L. A. McClure, Luverne (standing) helps indoctrinate: (L to R) vice-president—R. J. Salfer, Mankato; president—A. H. Kohler, Hibbing; and re-elected secretary-treasurer Wm. A. Ritt, St. Peter.

MEMBERS of the North Dakota State Electrical Board include: (L to R) George Yineman (journeyman electrician), Minot; Clyde Kieley, chairman (contractor), Grafton; Joseph Finell (REA representative), Finley; and Nick Frank (farmer representative), Dickinson. Board has jurisdiction over state licensing of electricians and operation of state electrical inspection.

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Engineering improvements in the design and construction of ROYAL-NOARK cartridge fuses mean that they stay cooler . . . give greater protection to vital equipment.
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a single priority, like the "DO". But he knows he probably will have to do the same for some supporting production, especially for components makers. How to devise a priority that will get the gear maker, for example, all the metal he needs, then get the gears into tanks and other military items first instead of autos will take lots of doing.

The controllers are virtually certain they'll have to keep close allotment of some forms of steel. Right now it looks as if plates, tubing and rod will be among those forms. Of course, many of the alloying materials also will be kept under wraps—particularly nickel, cobalt, columbium, tungsten, tantalum. Even at reduced rates of output, the military requirements for these steel hardeners look like more than is available without allotments.

And how much paper work still will face industry is something else that hasn't been settled. DPA wants to keep tabs on steel and aluminum use for a while longer. First, it has to see that their consumption won't snowball demands for copper. But, more important, it may be necessary to reimpose allotments. It would take only a worsening of the situation in Korea, another crisis like it, or even a long-drawn steel strike to force continued allotments of steel and aluminum. That's how finely balanced defense and civilian metals needs appear at this time.

Minnesota Contractors Convene at St. Paul

More than 300 registrants representing seven electrical contracting organizations attended the annual Electrical Industry Convention and sixth biennial Trade Exposition held at St. Paul, Minn., Feb. 24-28. A total attendance of better than 1,000 including representatives of contractors, utilities, manufacturers, wholesalers and dealers, inspectors, cooperatives, etc. Convention headquarters was St. Paul Hotel; exposition headquarters, St. Paul Municipal Auditorium.

As in the past, the program included separate business sessions for the participating groups, plus all-industry sessions. At the kick-off luncheon, Herbert Lewis, editor, St. Paul Dispatch and Pioneer Press, gave his impression of current international affairs based on recent trips around the world and on the continent.

Minnesota Electrical Association

Members of the Minnesota Electrical Association (Minnesota contractors outside the Twin-Cities area) held

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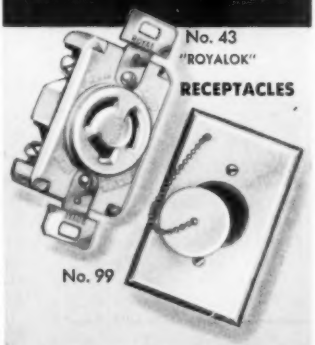

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CONTRACTOR Wm. S. Collins, former president, Minneapolis Electrical Contractors Association, receives congratulations and Golden Jubilee Award Certificate (for 50 years of service in the electrical industry) from Wm. A. Ritt.

their 24th annual meeting at the convention. President L. A. Mecure of Luverne reviewed association progress; urged continued and increased support of planned activities; revealed that a state-wide electrical inspection law was recently passed by the legislature but needs some refinement.

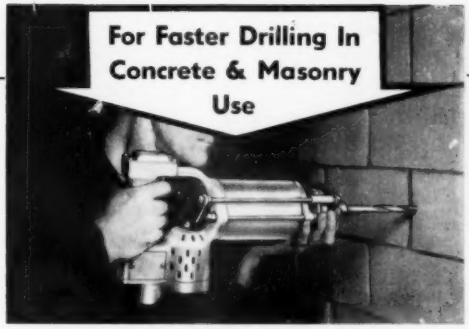
To get more of the consumer dollar, the electrical contractor must do a selling and advertising job, Gordon Tucker, manager, Midwest Electrical Council, told the group. He warned the contractor against being too preoccupied with his own technical problems to give selling attention.

A. H. Kohler, Hibbing, and M. I. Gordon, Albert Lea, reviewed the fundamentals of electrical estimating and reported on the success of the recent Iowa Electrical Association estimating school conducted at the Iowa State College in Ames.

What the contractor-dealer thinks about the appliance business was the subject of a paper prepared by Norman DeYoung of Fairmont. That there is room for improvement in manufacture-dealer relations was indicated by the statements made. DeYoung believes there are too many appliance lines; too many models in each line; too frequent a change in models which makes present merchandise obsolete and leads to distress selling.

W. D. Schoell, representing the Minnesota Association of Consulting Engineers, intimated that electrical contractors were lax in checking design and technical data and pictured the consultant as a protector of customer interests on a construction project.

New officers of the Minnesota Electrical Association, Inc., elected at this session are: President—A. H. Kohler, Hibbing; vice-president—R. J. Salfer, Mankato; secretary-treasurer—Wm. A. Ritt, St. Peter.



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HAMMER DRILLS

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Provide high speed hole drilling in concrete, brick and stone; the automatic rotation of the carbide tipped spiral drill speeds hole drilling, eliminates manual turning of drill chuck and reduces fatigue.

There's no cams or gears—just 3600 powerful blows per minute of one working part—The Piston!

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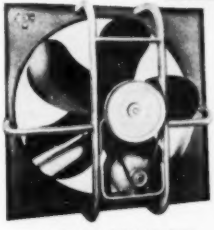

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STEP-UP OUTPUT and quality of workmanship, reduce industrial accidents and employee fatigue with proper ventilating and cooling equipment. CHELSEA Fans remove excessive heat, fumes, dirt, dust and grit, also dead stale air. 30 models, in over 200 sizes, are available, and each fan or blower is especially engineered and tested for its recommended application. All ratings are certified by P.F.M.A. test methods to insure proper performance. Check on your ventilating requirements, now.

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Midwest Electrical Council

Electrical Contractors' Day at the convention marked the 20th Annual Meeting of the Midwest Electrical Council (coordinating council for the seven electrical contractor organizations). The morning session, devoted to Council business, included a review of organization problems and ways of overcoming them plus an election of officers. The afternoon session was an open meeting devoted to visiting speakers representing various branches of the electrical construction industry.

The electrical contractor need not stand alone in his attempt to sell adequate wiring. There is plenty of outside aid available from related branches of the electrical industry, Francis Armin, director of consumer education, National Adequate Wiring Bureau, told the group.

The principal bulwark of the Free Enterprise System is the American Federation of Labor, according to Orlin Folwick, public relations director, Minnesota Federation of Labor. Believing that a well-paid worker, backed by a union, is a better workman in the long run, Folwick sees the need for union organization among wage earners in the smaller towns and communities.

As in the past, registrants attending this session were kept on the edges of their seats by the chemistry calisthenics of Sam Rosch, consulting cable engineer, Anaconda Wire & Cable Company, New York. After taking his audience through the chemical make-up of various insulating materials, Rosch made the following predictions: aluminum is no longer a substitute for copper, but a metal to be considered by itself in the electrical field; distribution voltages are going to 15,000 volts; the 1953 edition of the National Electrical Code will have a table of current carrying capacities for more than nine conductors in a raceway. If aluminum cable is to be used, it should be in sizes larger than No. 4/0 and only pressure type connectors should be used, he warned.

Council officers elected at the business session were: President—Moreau Bailey, Albert Lea; vice-president—Berger Indseth, Huron, S. D.; acting secretary—Wm. A. Ritt, St. Peter; treasurer—E. W. Linner, Stillwater, Minnesota.

A dinner and afternoon session were devoted to appliance merchandising problems. At the forum dinner meeting, W. T. Stuart, editor, *Electrical Construction & Maintenance* (pinch hitting for Laurence Wray, editor, *Electrical Merchandising*) and W. W. Garey, publisher, *Electrical Construction and Maintenance* and *Electrical Wholesaling*, joined H. A. Willis, Nelson-Willis, Inc., Minneapolis, in the panel discussion. Subject: the long range view in '52 and problems created by curtailed appliance production. At the afternoon session, Miss Armin discussed the need for Adequate Wiring while Albert P. McNamee, McCall's Magazine, spoke on merchandising and service management in periods of short supply.

HONORED at recent St. Paul electrical industry conference was Harry T. Bussmann (left), vice-president, Bussmann Mfg. Co., St. Louis, Mo., who received 50-year Golden Jubilee Award Certificate from Wm. A. Ritt, co-founder of the Award program.

At an all-industry lighting session, co-sponsored by the Twin-Cities Section, I.E.S., commercial, industrial and residential lighting techniques comprised the program. Carl Jensen, Westinghouse Electric Corp., lamp division, Chicago, revealed the progress made in lighting development. The opportunity presented by the home light conditioning program was outlined by L. H. Hruby, General Electric Lamp Dept., Nela Park, Ohio. Commercial and industrial lighting for defense was the subject of George W. Clark, Sylvania Elec. Products Co.

Glenn Rowell, electrical engineer, Fire Underwriters Inspection Bureau, Minneapolis and his panel of code experts appeared before a packed house to answer numerous prepared questions pertaining to code interpretations and inspector field problems. Panel members included Ed Heath, president, Minnesota Electrical Inspectors Association; Ray Braun, executive secretary, State Board of Electricity; S. Martin Streed, chief electrical inspector of Minneapolis; Carl Mertz, Northern States Power Co., St. Paul.

The importance of demonstrations and advisory services in promoting farm electrical equipment were the topics at the Rural Electric Equipment Meeting. Speakers included Don Bates, University of Minnesota; Marvin Nabbin, Northern States Power Co., Minneapolis; C. R. Gustafson, Otter Tail Power Co., Fergus Falls; Miss Bertha Lage, G. E. Supply Corp.,

St. Paul; and Don Ross, Successful Farming, Des Moines, Iowa.

Golden Jubilee Awards

Three electrical contractors were honored by receiving Golden Jubilee Awards presented each year, by the North Central Electrical Industries, to members of the electrical industry who have completed 50 or more years of service in the electrical field. They were: William S. Collins, Minneapolis; P. E. Sievert, Hastings, Minn.; and Roy Y. Hughes, Mitchell, South Dakota.

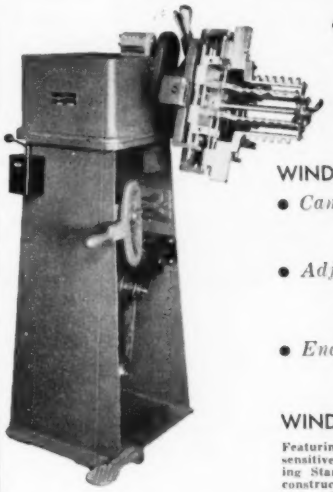
Others honored at the annual banquet by receiving award certificates were: Harry T. Bussmann, vice-president, Bussmann Mfg. Co., St. Louis, Mo.; Claude E. Dudley, superintendent of municipal utilities, Kenyon, Minn.; J. F. McGuire, retired manager for Northern States Power Company's St. Paul Division; and William H. Selck, member of the sales organization of the W. A. Roosevelt Co., LaCrosse, Wisconsin.

Henges Elected President of Graybar

W. E. Henges has been elected president of the Graybar Electric Company. A. H. Nicoll, who formerly held the office of both president and chairman of the board, continues as chairman.

Mr. Henges joined Graybar 39 years ago as a receiving clerk in St. Louis. He rose to the position of district manager there in 1942 and two years later was transferred to Cleveland in the same capacity. He was elected a director of the company in 1949, became vice president in 1950 and early last year was elected a member of the Executive Committee.

W. E. HENGES



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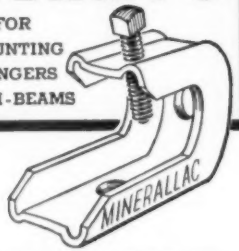
FOR MOUNTING HANGERS ON I-BEAMS



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NISA News

The Niagara Chapter February meeting was held February 8 at the Buffalo Athletic Club. Forty-five members were present from Jamestown, Syracuse, Rochester, Niagara Falls and Buffalo.

Fred Wipperman, National Executive Secretary, gave an impromptu talk on the functions of the National Office, use of it by the members, and the promotion of NISA Rebuilding Standards for the betterment of the repair industry.

Selden High, of the Sullivan Electric Co. of Cincinnati, Ohio, gave an address on "Old Man Overhead". His talk covered computations for mark-up on labor and materials to provide for overhead—and for net profit.

• • •

Frank Schaef reports on The Quaker City Chapter, which was held February 13 at Beck's on the Boulevard, Philadelphia. Roll-call showed 36 present and President Jos. B. Wagner presided.

C. H. Guy, Jr., of the Safety Seal Co. of Burbank, Calif. gave a presentation of the Safety Seal material now being marketed by them, for use in very unusual applications, where this semi-conductor, semi-insulating material promises new horizons.

• • •

The Los Angeles Chapter had its meeting on February 12, at the Rodger Young Auditorium. The theme of the evening was: "Inspection and Testing of Electric Motors".

Because the subject is so broad, three speakers were present. The first speaker, Gilbert Whitman of Electra Motors, Inc., spoke on the subject "Small and Fractional Horse-Power Motors." Second speaker George Larsen, of Larsen-Hogue Electric Co., talked on "Polyphase Motors." The final speaker, Earl Sweinhart of Sweinhart Electric Co., discussed the inspection and testing of "D-C Motors" including arc welders.

• • •

Northern California Chapter met February 4 at El Jardin Restaurant.

Action was sought to get a more appropriate price regulation for the industry than CPR-34. This question is one which all chapters should consider. If any practicable improvements can be suggested, the suggestions should be sent to National Headquarters—attention DCC.

• • •

The annual 7th Regional Meeting in Cincinnati, February 9, attracted a good attendance, mostly from Indiana, Kentucky, Ohio and West Virginia. The day-long program was arranged as a series of forums, each with a group of experts on these subjects: Pricing Problems under OPS; Wage and Salary Stabilization; Office Methods; Taxation; Shop Short Cuts.

• • •

John Hilburn, Boese Hilburn Electric Company of Kansas City, has been elected President of the Electric Association of Kansas City for the current year.

• • •

The annual Foremens' Meeting of the New England Chapter of NISA was held at the Hotel Bradford on Saturday, February 18, in place of the regular monthly meeting.

Registration started at 11:00 A.M. and was followed by a luncheon at which 160 people were served.

Following luncheon, the Afternoon Forum was held with Harry Bedig as chairman. Speakers were heard from the Dolph Varnish Co., Pangborn Corp., General Electric Co., and several NISA members.

Following this the Foremens' Meeting idea clinic got under way with Fred Ferris as chairman. The first prize was won by George A. Paine of the New England Machine and Electric Co., the second by Murrell E. Biskle of the Empire Electric and the third by Gilbert Fantes of the Wolco Electric Co. The prizes were: First—$25.00; Second—$15.00; Third—$10.00. The other eight contestants were given $5.00 each.

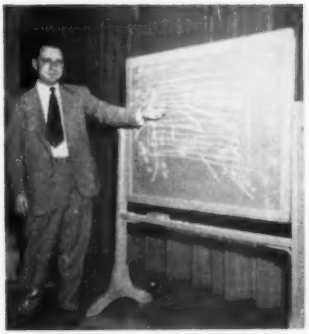
The meeting then adjourned and all present gathered in the Sky Room where a cocktail hour prior to dinner was enjoyed. Included among those present were National President Mike Zack and Mrs. Zack from Mason City, Iowa. Also a very large delegation—40 members—from the Metropolitan Chapter of N. Y.

• • •

Monthly meeting of the New York Metropolitan Chapter was held at Hotel Shelburne on February 28. S. Bojack presided. Extensive report on Foremens' Meeting in Boston was given by members who visited this outstanding and impressive session.

Walter J. Prise, Chairman of 1953 Convention Publicity Committee reported on the proposed program for the Convention Publicity Committee and suggested that the Chapter should develop a catchy slogan for the forthcoming meeting. This idea was accepted by the membership and members were asked to participate by sending their suggestions for the slogan to the Publicity Committee.

From Walter J. Prise, The Maintenance Company, Inc., New York City.



ECONOMICS OF HIGH voltage lighting system (480/277-volt, 3-phase, 4-wire) is discussed with aid of blackboard diagrams by Frank McShane, Commonwealth Edison Company at recent Chicago Lighting Institute industrial lighting conference for plant engineers and executives.

Among the Manufacturers

Headquarters Announcements

Westinghouse Electric Corp., Pittsburgh, Pa.—Chris H. Bartlett, manager of the Transformer Division.

General Electric Company, Pittsfield, Mass.—William S. Ginn, general manager of the Power Transformer Dept.; Raymond W. Smith, general manager of the Distribution Transformer Dept.; Alfred W. Hough, general manager of the Capacitor Dept.; Samuel H. Thomas, manager of power transformer sales; Edward V. Dillon, manager of voltage regulator sales; Clement E. Sutton, Jr., manager of distribution transformer sales; Harold M. Towne, manager of lightning arrester and cutout sales; F. G. Stebbins, manager of power factor capacitor sales; D. J. Harrington, manager of specialty capacitor sales.

Air Reduction Co., Inc., New York, N. Y.—Dale D. Spoor, manager of Airco's Equipment and Process Sales Department.

Graybar Electric Co., Inc., New York, N. Y.—R. B. Sayre, assistant vice president.

General Electric Company, Louisville, Ky.—Neil J. Curlee, manager of manufacturing, product service, Major Appliance Division.

Bulldog Electric Products Company, Detroit, Mich.—Elmer Richmond, supervisor of the new Urbana, Ohio, branch plant; Herb Bliss, supervisor of the new Detroit, Mich., branch plant.

Moisture cannot penetrate the one-piece Neoprene body of a JOY electrical plug . . . when engaged, even its contacts are enclosed in a protective Neoprene housing through the *cork-like* action of JOY'S famous water-seal. Permanently vulcanized to cable, it cannot crack . . . won't lose its shape . . . and requires no special considerations to insure a long life of useful service. A favorite since '26, JOY electrical connectors are now available in styles and sizes for nearly any portable electrical power transmission need. Why risk electrical misfits when the best actually costs less, in the long run? Write for full details including your copy of Bulletin MC108 today!

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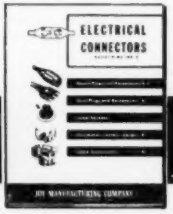

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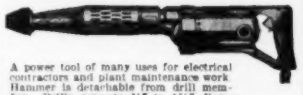

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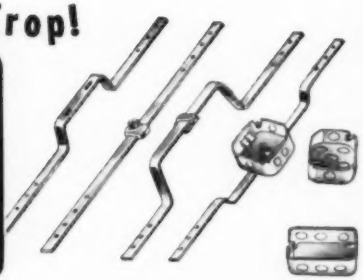

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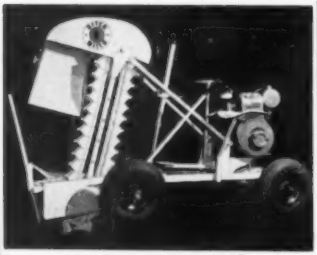

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USE OF LOCAL lighting to spot insignia defects on aircraft is demonstrated by R. J. Diefenthaler, General Electric Co., at recent Chicago Lighting Institute all-day conference on industrial lighting.

Curtis Lighting, Inc., Chicago, Ill. —G. South Dunn, assistant to the president.

General Electric Company, Fort Wayne, Ind.—John C. Helies, general manager of the Appliance Control Department, Morrison, Ill.

Jerrold Electronics Corp., Philadelphia, Pa.—Caywood C. Cooley, sales manager; Carl W. Schmelzle, assistant sales manager.

General Electric Company, Lynn, Mass.—Donald E. Craig, manager of the Somersworth, N. H., plant of the meter and instrument dept.; John C. Garrett, acting manager of marketing for the department.

Benbow Manufacturing Co., Burlingame, Calif.—has been completely reorganized in personnel, products and distribution methods.

General Electric Company, Schenectady, N. Y.—Carl A. Salmonsen, general manager of the new Industry Control Department of the Switchgear and Control Division.

Gilbert Manufacturing Co., Inc., Long Island City, N. Y.—Frederick D. Keeler, general manager.

General Electric Company, Bloomfield, N. J.—L. E. Thompson, manager of marketing for the Air Conditioning Division.

Regional Appointments

NEW ENGLAND

Minnesota Mining & Mfg. Co.: W. M. Hobelsberger, manager of the new Boston, Mass., branch office and warehouse.

MIDDLE ATLANTIC

General Electric Company: Glen R. Brownback, manager of the New York branch of General Electric Appliances, Inc.

Eutectic Welding Alloys Corp.: Woodrow W. Shackleford, sales repre-

sentative for Buffalo and upstate New York areas.

SOUTH ATLANTIC

Dongan Transformer Co.: George R. Koeln, Atlanta, Ga., sales representative for North Carolina, South Carolina, Georgia, Tennessee and Alabama.

Mathias Klein & Sons: Arnold L. Moore, Atlanta, Ga., representative in the South and Southwest.

Union Insulating Co.: Clyde R. Palmer, district sales manager for eastern Tennessee, Alabama, Georgia, South Carolina and Florida.

Revere Electric Mfg. Co.: S. L. Bagby Company, Charlotte, N. C., representative for Virginia, North Carolina and South Carolina; Kenneth Hill, Mount Dora, Florida, representative in Florida.

EAST CENTRAL

General Controls Company: William M. Roecker, manager of the Cleveland, Ohio, branch office.

Bulldog Electric Products Company: Byron O. Beckley, Cleveland, Ohio, district manager.

The M. B. Austin Company: Duizend, Fain & Levin, New Orleans, La., representative for Louisiana, Mississippi, Alabama and upper west Florida.

Mathias Klein & Sons: Charles F. Castino, Chicago, Ill., representative; W. J. McAmis, Chicago, Ill., representative for the North Central States.

WEST CENTRAL

General Electric Company: William B. Frogue, manager of the St. Louis, Mo., branch of General Electric Appliances, Inc.

Graybar Electric Company: F. M. Sholders, lighting manager of the Omaha, Nebraska, branch.

The Pyle-National Company: Robert R. Anderson, sales representative in the St. Paul, Minn., office.

Mathias Klein & Sons: George W. Kidd, St. Louis, Mo., representative in the Central States.

Toledo Pipe Threading Machine Co.: Harry C. Cochran, representative for Texas, Oklahoma, Louisiana and Arkansas.

Sterling Electric Motors, Inc.: J. D. Trice, manager of the New Orleans, Louisiana, sales office.

WEST

Eutectic Welding Alloys Corp.: Robert B. Welch, sales representative for Los Angeles and the West Coast.

Toledo Pipe Threading Machine Co.: Harold W. Sabin, Seattle, Wash., representative for Washington, Oregon, Montana, Idaho, Utah, Wyoming and Vancouver and Victoria, B. C., Canada.

Sterling Electric Motors, Inc.: James R. Hughes, manager of the Denver, Colorado, sales office.

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1—G.E. 50 HP induction Motor 3 Phase, 60 Cycle, 440 Volts 360 RPM.
1—G.E. 40 HP. Motor 3 Phase, 60 Cycle 440 Volts 1140 RPM.
1—Ingersoll-Rand 12x9 Air Compressor and silencer 30 HP Motor 3 Phase 60 Cycle 220/440 Volts V-Belt drive.
1—Ingersoll-Rand 12x6 Air Compressor 15 HP Motor 3 Phase 60 Cycle 220/440 Volts V-Belt drive.
1—Penn 12x6 Air Compressor 20 HP Motor 3 Phase 60 Cycle 220/440 Volts V-Belt drive.

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- for every industrial and power application.
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- Large stocks on hand of high voltage, lead covered cables not ordinarily stocked by your regular suppliers.
- Cut to length. Reasonably priced.

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New and Guaranteed Rebuilt
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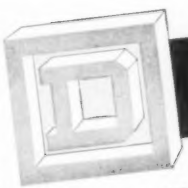

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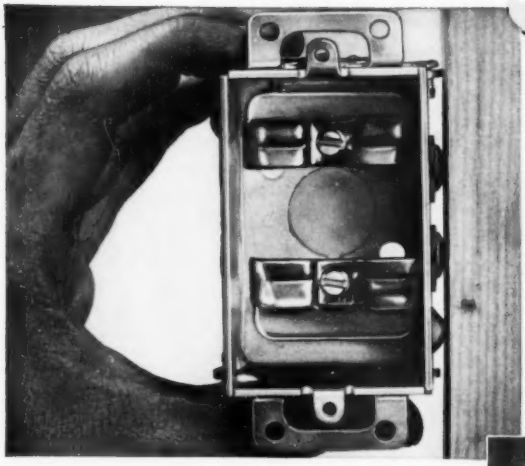
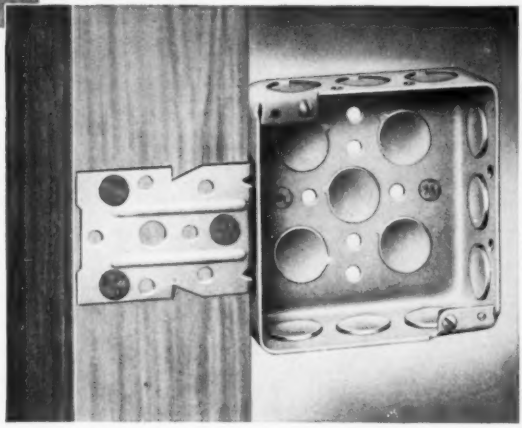


1 THE FAMOUS G-E LEVELOCK LINE OF SWITCH BOXES—This line of General Electric switch boxes is fast becoming the standard of the trade for installation speed and improved performance.

Four leveling projections make Levelock boxes a cinch to level. Just place them on a flat surface, and they can't rock or tilt. New locking device prevents plates from falling off when other trades are working around Levelock boxes—makes ganging easy. Use G-E Levelock boxes on your next job, and you'll use them on every job. Available in 2½-in., 2¼-in., and 2-in. depths.



2 NEW, RUGGED STANDARD BRACKET BOXES—New, ribbed bracket and non-welded assembly of standard G-E bracket boxes offer you speedier installation, prevent costly rework.

Ribbing at top and corner of bracket maintains alignment during mounting. Non-welded assembly of bracket and box holds firm in the face of heavy construction-site abuse.

Ask your distributor about the new G-E standard bracket boxes with non-welded, reinforced design.

3 QUICK-FIGURING BOX GUIDE—This new circular slide rule tells you at a glance the maximum number of conductors permitted in various G-E boxes. On the job and in your office it can save you a good deal of precious time by putting complete box information at your fingertips in easy-to-use form.

The reverse side of this selector is a quick raceway calculator designed for fast selection of raceway sizes.

Get your *G-E Conduit Products Selector* from your General Electric Construction Materials distributor.

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FOR CONDUIT INFORMATION see your local G-E Construction Materials distributor. Section C8-418, Construction Materials Division, General Electric Company, Bridgeport 2, Connecticut.